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CHEMISTRY OF THE AUSTRALIAN BUSH*

By PROFESSOR JOHN READ

St. Andrews University

A STRANGE FLORA.

From its discovery onwards, Australia has appealed to the outside world as the habitat of a strange flora and fauna. Multitudes who have never been remotely 'within coo-ee' of the great southern continent picture it to themselves as the land of the Eucalypt and the kangaroo. A great deal lies behind this popular conception of Australia. The Eucalypt and the kangaroo are vivid symbols of a unique flora and fauna; more than that, in some degree they are typical survivals into the present age of an order of living things inherited from a remote epoch, and elsewhere obsolete or non-existent. This ancient order, seemingly unchangeable or developing in a unique manner in its isolated Australian environment, has stamped its impress as deeply upon the indigenous plant products of Australia as upon visible characters of the parent flora.

The strangeness of the indigenous flora of Australia to the European visitor arises from the fact that so much of this vegetation belongs to the Myrtaceae, a large family of which Europe claims only a single species in the sweet-scented myrtle of the poets (*Myrtus communis*). In Australia, there are more than eight hundred species of Myrtaceae, a number exceeded only by the much less conspicuous Leguminosae, with some thirteen hundred species. Of the forty-five genera of Myrtaceae represented in Australia, the most important is *Eucalyptus* [14]. This genus is a highly specialized form of myrtaceous plants, developed in great profusion probably after the separation of Australia from the great tropical lands and adapted to its xerophilous and more barren environment [14]. Among other myrtaceous genera occurring in Australia are *Myrtus*, *Eugenia*, *Angophora*, *Backhousia*, *Melaleuca*, *Leptospermum*, and *Darwinia*. The last three of these genera are shrubby, the others, like *Eucalyptus*, mainly trees. All of them except *Myrtus* and *Eugenia*, which bear fleshy berries, have dry fruits. Myrtaceous genera with dry fruits are chiefly Australian, but a few representatives are found in New Guinea, Celebes, New Caledonia with neighbouring islands, and New Zealand. The shape and size of the fruits are important in the identification of *Eucalyptus* species. The indigenous occurrence of the genus *Eucalyptus* is mainly confined to Australia, New Guinea, and Celebes, but suitable species are now cultivated extensively in many other countries, ranging from New Zealand to California, South Africa, and the Mediterranean region, mainly as timber trees of exceptionally rapid growth, and for their beneficial effect when planted in marshy land. For example, near Rotorua, New Zealand, *E. oreades* readily grows to a height of 120 ft. in thirty years.

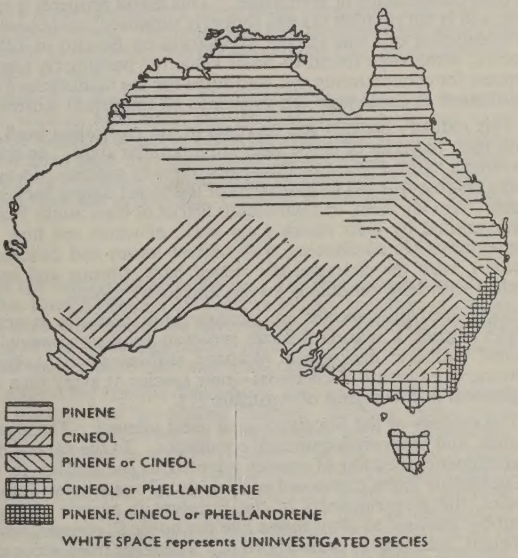

FIGURE 1 – *Phytochemical distribution of* Eucalyptus *in Australia. The map shows approximately the geographical limitation of* Eucalyptus *species according to the main chemical constituents in their oils.*

(R. T. Baker and H. G. Smith [2].)

THE EUCALYPTUS OIL INDUSTRY.

Although the biochemical features of living organisms are much less obvious than their morphology, yet the earliest settlers in Australia quickly became aware of the richness of the trees and shrubs of the 'Bush' in fragrant oils and also in resinous exudations. The latter products, so common among Eucalypts, were mistakenly called 'gums', and the name was transferred to the trees themselves. The timbers of numerous species of *Eucalyptus* are deservedly held in much esteem [1]; but chemically the greatest interest of this premier genus of Australia lies in its essential oils.

These oils are secreted in minute, semi-transparent leaf glands, which may be seen when a leaf is held up to the light; sometimes, too, a similar oil is found in the bark and wood. Essential, or essence-like, oils possess fragrant

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odours, as the name indicates. They are more mobile and more volatile than the 'fixed' plant oils, such as linseed, cotton-seed, coco-nut, and olive oils; unlike these oils, they are not of a fatty nature, and are unassimilable. Their high inflammability is largely responsible for the fierceness of Australian bush fires. Besides *Eucalyptus*, the other myrtaceous genera already mentioned are also lavish sources of essential oils, and so are many other native Australian plants belonging to the Coniferae, Rutaceae, Labiatae, and other families. Thus the essential oil industry, which grew up in Australia around the Eucalypts, has gradually extended to embrace many species in other genera and families of indigenous plants.

Of all such oils, those of the Eucalypts are by far the commonest and the most important. It is often supposed that 'eucalyptus oil' is a standard material consisting mainly or wholly of eucalyptole, otherwise known as cineole, the odour of which is disseminated so freely from handkerchiefs during epidemics of colds or influenza. The term 'eucalyptus oil', however, is a vague one with no precise meaning. In fact, each species of *Eucalyptus*—of which more than three hundred[1] are known—has its own distinctive oil, and each oil is a complex mixture of constituents. The odours of eucalyptus oils range indeed over a wide gamut, including turpentine, eucalyptole, peppermint, lemon, and geranium among its dominant notes.

These oils and their numerous ingredients have been applied in many ways. The original uses of eucalyptus oils were medicinal. For such purposes the oil of *E. globulus*, or Blue Gum, formerly took first place; but eventually this was replaced by cineole oils of the same general character obtained from species producing higher yields of oil. Thus, the leaves and twigs of *E. globulus* furnish less than 1 per cent. of oil, a yield which is doubled in *E. polybractea* and nearly quadrupled in *E. australiana*. These three oils are rich in cineole, and are used mainly as mild disinfectants or germicides. This useful property is exhibited in different degrees by many other eucalyptus oils, and is not peculiar (as was formerly supposed) to those containing cineole. The first factory for the extraction of eucalyptus oils was started in Victoria by Bosisto in 1854. As the oils from various species became better known, some were found to be of value for perfumery, some for use in special processes such as the 'flotation' process for concentrating ore, and some for the manufacture of fine organic chemicals. Eventually, therefore, the distillation of eucalyptus oils grew into an important Australian industry.

This industry literally has its roots in the Australian bush, and in favourable localities the oil distillers' camps with their batteries of crude stills are a familiar sight. In travelling along a bush track in such a region one may traverse a natural forest of Eucalypts of many species. In age, these may range from seedlings a few inches high and a few months old to monarchs of the forest dating back before the days of Captain Cook and the First Settlement. Among them, in a particular district of New South Wales, may be seen gigantic Bloodwoods (*E. corymbosa*), distinguished by their rough scaly bark, of warm red hue, and long dark dribbles of exudation; clean-limbed Peppermints (*E. phellandra*), with narrow leaves and delicately latticed bark; lofty White Stringybarks (*E. eugenioides*), with the characteristic ridged bark, fibrous and inter-twining; graceful Gully Ashes (*E. smithii*), grey-limbed with long pendulous leaves; and many others.

Such eucalyptus species are strongly individualistic in appearance. Between their boles, in this New South Wales district, a luxuriant scrub grows in profusion: many species of *Leptospermum*, with small sweet-scented leaves; feathery, dark-green Wattles; stiff-leaved Banksias; slender-stemmed waratahs; soft-petalled flannel flowers, reminiscent of edelweiss—new species at every turn illustrating the richness and strangeness of the bush vegetation in this region of Australia [7].

The ecology of the Eucalypts is of great interest. The species differ greatly in kind according to soil, altitude, climate, and other environmental conditions. In the natural distribution of the genus, each region thus possesses a characteristic selection of species adapted to the locality in which they grow. In general, it is unusual to find a Eucalyptus forest composed exclusively of one species; for, with the exception of *E. phellandra* and a few other species, the gregariousness of the Eucalypt is generic rather than specific. Eucalypts vary in size from small shrubby 'mallees' to giant forms like the noble *E. regnans*, which, in Gippsland, has been known to exceed 300 ft. in height, with a girth of nearly 70 ft. The large trees occur chiefly in regions having a sandy soil poor in mineral constituents, of which they store only a minute amount (0·025 to 0·05 per cent.) in their timber: this peculiarity has been advanced as a prime factor affecting their growth to such great dimensions.

The suitability of a species as a commercial source of oil depends upon the composition and yield of the oil; also, for naturally growing trees, upon the accessibility of the species. The average yield of oil furnished by the mature leaves and terminal branchlets ranges from about 3·5 per cent. in *E. australiana* and *E. phellandra* to 0·06 per cent. in *E. corymbosa*, and dwindles to mere traces in still poorer species. In the harvesting of Eucalyptus leaves for distillation, the trees may either be lopped or felled; although felling may appear extravagant, it is often favoured by experienced distillers. When the tree is cut within a foot or two of the ground, a strongly foliaceous 'sucker growth' soon appears, and this may be cut again and again without destroying the reproductive capacity of the tree. The phoenix-like Eucalypt conforms to the general motto of the Australian flora, which is '*Resurgam!*' It combines amazing vitality with unusual rapidity of growth in favourable conditions; thus, after the lapse of a couple of years, the decapitated stump may have surpassed the ideal of Dean Swift by producing not merely two, but three, or even four, sturdy stems where only one grew before.

The scrub of Blue Mallee (*E. polybractea*) in the Wyalong district of New South Wales is sometimes treated still more severely. Mallees are dwarf Eucalypts having a bunchy growth of small stems springing from a root-crown.

[1] The number of *Eucalyptus* species recognized by different investigators varies over a wide range, up to a maximum of some five hundred. There are also considerable variations in the nomenclature of the genus: for the purposes of this account it has proved simplest to adopt the nomenclature of Baker and Smith [2].

In western New South Wales, and also in South Australia and other regions, mallee Eucalypts cover large areas. One of them, *E. oleosa*, stores water in its roots, a beneficent provision which was appreciated by the Australian aborigines. Three mallees in particular yield excellent cineole oils: besides the Blue Mallee of New South Wales, these are *E. odorata* and *E. cneorifolia*, from which the bulk of South Australian eucalyptus oil is distilled; the last-named species occurs chiefiy on Kangaroo Island.

In dealing with the Blue Mallee, the distiller flattens and partly uproots the scrub by driving a heavy roller over it, and after the roughly treated vegetation has dried in the strong sun he completes its seeming destruction by burning it off. The bare waste which repels the eye at this junction seems to lack any germ of life. *Resurgam!* In a short time the irrepressible Eucalypt reappears: a pleasing dull blue mantle of *E. polybractea* covers the landscape; and after a twelvemonth the distiller's faith is justified by the sight of a luxuriant growth of mallee rising waist high.

The harvesting of the leaves is simpler from mallees than from trees, but the remaining operations are the same for material from either source. In order to liberate the oil, the leaves are brought into contact with steam: this bursts the oil-glands and causes a slow vaporization of their contents. The crude field-still consists of a cubical iron tank with a capacity of 400 gallons, corresponding to about 800 lb. of material when fitted for open firing. The tightly packed leaves rest upon a grating, below which water is boiled by means of a wood fire beneath the tank. As the steam forces its way up through the mass of leaves it becomes charged with the vaporized oil, and the mixed vapours are condensed during their passage through a water-cooled exit tube. The liquid mixture of water and oil runs down into a receiver which is so constructed as to allow the relatively small layer of oil to be drawn away from the water on which it floats. In the more refined types of distilling plant, steam is generated in an independent boiler and passed under pressure into a series of digesters, these being sometimes sunk into the ground in order to facilitate the handling of the fresh and spent leaves. The procedure now outlined is not restricted to the winning of eucalyptus oils: it may be applied generally in the separation of essential oils from plant materials, provided that the chemical constituents are not damaged by steam.

There are many cineole-bearing species, and the reputation of the cineole oils has suffered in the past owing to occasional confusion in the field. A vernacular name, such as Messmate, may be interpreted in various ways, according to local opinion; hence, many years ago, reliable distillers began to adopt the systematic latinized names. The use of scientific nomenclature 'out back' in the Australian bush may cause surprise; yet—as a 'bushwhacker' once remarked, in somewhat different words—there is nothing inherently difficult in the pronunciation of *Eucalyptus macarthuri*, and the name is decidedly more euphonious than the synonymic 'Camden Woollybutt' or 'Paddy's River Box'.

Chemical Characteristics of Eucalypts.

It is now time to sketch in the scientific background of the eucalyptus oil industry. The first chemical investigation of such an oil was carried out by Cloëz in 1870: this French chemist obtained an impure specimen of cineole by fractionally distilling the oil of *E. globulus*. Since that time numerous investigators, in Australia and elsewhere, have gradually unfolded the fascinating chemistry of the Australian flora. At the present day, in the genus *Eucalyptus* alone, the essential oils of some two hundred species have been examined chemically.

So interwoven are the relationships in this genus, so refined the specific distinctions, that effective studies could be prosecuted only through the combined efforts of the botanist and the organic chemist. Happily such a collaboration was forthcoming. In 1895, H. G. Smith (1852–1924) published, in collaboration with J. H. Maiden, the distinguished Australian botanist, his first original contribution to organic chemistry, in the form of a paper dealing with eucalyptus kinos, or resinous exudations. In the same year, R. T. Baker (1854–1941) became Curator of the Sydney Technological Museum, where he acted also as Economic Botanist; and in 1899 Smith was appointed Assistant Curator and Economic Chemist at the Museum. The two colleagues entered into an enthusiastic collaboration, and from that time until their retirement in 1921 carried out at the Museum a classical series of botanico-chemical investigations on the Australian flora. Baker and Smith were both born in Kent, England, and made their ways separately to Sydney in the early eighties; they were pioneers of scientific investigation in a new country, and it is remarkable that both of them were largely self-educated for their main life-work. Handicapped in various ways, and receiving less scientific recognition and material reward than could have been desired, they were animated by the spirit which inspired Scheele, of whose life and work Smith was a great admirer: 'The elucidation of new phenomena is my sole concern', wrote Scheele to Gahn in 1774, 'and how happy is the investigator when the final success of his struggles brings joy to his heart'.

The researches of Baker and Smith on the genus *Eucalyptus* were published at Sydney in 1902, with a revision in 1920 [2]. These researches on the essential oils of numerous species, representative of the Australian mainland and of Tasmania, showed that altogether the genus elaborates more than forty distinct chemical constituents of such oils, of which about half owed their first recognition in eucalyptus oils to Smith. Most of these substances are hydrocarbons or oxygenated derivatives belonging to the terpene series, such as pinene, phellandrene, limonene, cineole, piperitone, eudesmol, geraniol, citral, and citronellal; in addition, there are aliphatic and aromatic constituents. Some of them are peculair to the Australian flora, which also provides the most abundant source of some of the others.

Each oil contains a certain selection of these constituents in fairly definite proportions, and is thus distinctive for the species. The composition of the leaf oils appears to remain sensibly unchanged in Eucalypts cultivated outside their natural Australian habitat [4]. The yields of oil may be increased considerably by cultivation. Baker and Smith concluded that *Eucalyptus* species may be characterized chemically as well as morphologically.

More remarkable still, they were sometimes able to discern a chemical distinction between closely related species, or varieties, when no decisive morphological distinction was apparent. For example, they founded the species *E. phellandra* almost wholly on chemical evidence: 'the economic importance of separating this species from *E. australiana*', they wrote in 1920, 'can be judged from the fact that at the present time the value of the oil of the latter species is more than double that of *E. phellandra*'.

This quotation illustrates the dual significance of Baker and Smith's collaborative researches, in which the latent economic possibilities were no less important than the immediate scientific advances. The full value of *Eucalyptus* oils as sources on a vast scale of many fine organic chemicals gradually became evident. The crude oil of a good cineole-bearing species, such as *E. polybractea* or *E. smithii*, may contain more than 80 per cent. of cineole, which separates readily (especially from the 'first-hour oil' of the distillation) as a glacial crystalline mass when the oil is cooled in an ammonia refrigerator. *E. dives* oil, when fractionally distilled, may yield about 50 per cent. of piperitone and 40 per cent. of phellandrene: thus it becomes a potential source of such related substances as thymol and menthol. The oil of *E. macarthuri*, containing some 75 per cent. of geranyl acetate, together with a little free geraniol, offers an abundant source of this valuable ingredient of perfumes; this oil contains in addition the much rarer eudesmol, a sesquiterpene alcohol. In New Zealand, where this species is valued also for general and farming purposes, it is grown in extensive plantations around Rotorua.

The crude oil of *E. citriodora*, the 'citron-scented gum' of North Queensland, consists almost wholly of citronellal (90 per cent.); and another Queensland species, *E. staigeriana*, yields a lemon-scented oil containing about 16 per cent. of citral. This oil played a part in one of H. G. Smith's most spectacular demonstrations of the value of Australian plant products for everyday purposes [8]. On the occasion of a formal dinner famous in the annals of the Royal Society of New South Wales, Smith smuggled into the menu an alleged sago pudding flavoured with lemon, which, during his after-dinner speech, he divulged to have been made under his supervision from the starch of the Burrawang 'Palm' (*Macrozamia spiralis*), flavoured with the leaf-oil of the 'lemon-scented ironbark' (*E. staigeriana*).

Baker and Smith's generalizations from this joint work are remarkably interesting. They concluded that the oil from any *Eucalyptus* species growing under natural conditions maintains a comparatively constant composition; that each chemical constituent increases in amount through a sequence of species until it reaches a maximum in one or more of them; and that a connexion exists between certain morphological characters, notably the type of venation of the mature lanceolate leaves, and the chemical nature of the oil. A 'feather' venation (as in *E. corymbosa* and *E. calophylla*, the 'Red Gum' of Western Australia) denotes the presence of pinene and possibly of bornyl acetate (Group I); an intermediate venation (as in *E. globulus*, *E. smithii*, and *E. polybractea*) is a sign of the occurrence of pinene with cineole (Group II); and a 'butterfly-wing' venation (as in *E. piperita* and *E. dives*) points to phellandrene and possibly piperitone or geranyl acetate (Group III).

Thus, a large number of *Eucalyptus* species fall into one of three main groups, of which the chemical characteristics may be deduced from a mere inspection of the leaf-venation [11]. This is a startling conclusion, suggesting *inter alia* a revival of the mediaeval doctrine of signatures [10], according to which 'the president of *Nature* conveyed valuable information to man by insculping notable and marvelous *Figures* upon *Plants* . . . and other inferior *Bodies*'. This idea may be carried still further with certain species. For example, *E. gullicki* and *E. haemastoma*, sometimes found growing side by side, are much alike in the field, being trees of medium size with a smooth, white bark. Both the venation of the leaves and their odour, when crushed, indicate, however, that *E. gullicki* secretes cineole (Group II) and *E. haemastoma* phellandrene (Group III). More than this, the latter species, which is known also as Scribbly Gum, almost always shows insect markings, resembling scribbles, on the bark, while *E. gullicki* is innocent of such markings. *E. punctata* and certain other species exude warty masses of 'eucalyptus manna' from insect punctures in the bark and leaves: this curious product consists of a sugar, raffinose.

An Evolutionary Theory.

A larger outcome of these phytochemical researches, which embraced the detailed examination of other botanical and chemical features (including the morphology of anthers and cotyledons, the colours of timbers, and the chemical nature of exudations), was Baker and Smith's development of an evolutionary theory, dealing with a geographical and chronological sequence in the genus *Eucalyptus* [2]. There is evidence that the genus may have occurred in Tertiary, or perhaps Cretaceous, times in the northern hemisphere; but Baker and Smith's theory relates only to Australia. According to this theory, the genus perhaps originated in north and northwest Australia, none but the oldest species being found in this region: these belong to Group I, and have 'feather'-veined leaves yielding a maximum of about 0·5 per cent. of a pinene oil. Chemical evolution is held to have accompanied botanical evolution. As the genus spread slowly eastwards and southwards, the evolution of new species was determined by changing conditions of soil and climate, and the pinene-cineole oils of Group II made their appearance. At the end of the evolutionary scale, the most recent species—those of Group III—occur only in southeast Australia and Tasmania. In the passage from the 'feather' to the 'butterfly-wing' venation the angle between the midrib and the lateral veins becomes progressively more acute, and in the last two groups the yield of oil rises to a maximum of about 4·5 per cent., since there is more room for oil glands between the lateral veins of the last two types than in the 'feather'-veined structure.

The primary type is persistent, some species being common to the western (Perth) and eastern (Sydney) regions, although no representative is known in Victoria (apart from the eastern coastal strip) or Tasmania. Even the most recent species are very old: more than half of the indigenous Tasmanian species are found on the mainland, and it is concluded that these must have been distinct species long before the formation of Bass Strait.

Besides the three main groups of *Eucalyptus* included in this supposed order of evolution, the evolutionary classification takes into account such exceptional species as *E. macarthuri* and *E. citriodora*, in which the chief constituents of the leaf oil are geranyl acetate and citronellal respectively. Baker and Smith regarded such isolated species as botanico-chemical outliers, or end members of sequences in which the passage forms have disappeared in the course of the evolution [13, 14].

These extensive researches were continental in scope, but Baker and Smith were men imbued with an extraordinary enthusiasm which no obstacles could daunt. They were apostles *par excellence* of the Eucalypt. Towards the end of their labours they wrote: 'In the genus *Eucalyptus*, Australia has a commercial asset of so diversified and valuable a nature that it has no compeer in any other genus in the whole botanical world'.

More about Australian Plant Chemistry.

Although the genus *Eucalyptus* overshadows the bush, there are many other Australian plants of great chemical interest [13]. Thus, besides Eucalypts, myrtaceous plants include the so-called 'tea-trees', belonging to *Melaleuca*, *Leptospermum*, and other genera, the popular name for which arose from Captain Cook's reputed use of the leaves of *L. scoparium* as a substitute for tea. These are shrubs or trees with sweet-scented leaves: the leaf oil of *L. liversidgei*, for example, contains 60 per cent. of citral; *L. citratum* secretes citronellal as well as citral. An even richer citral oil, consisting of the almost pure substance, is found in *Backhousia citriodora*. *Darwinia fascicularis*, a low shrub growing on waste sandy land, yields a valuable leaf oil which vies with that of *E. macarthuri* as a source of geranyl acetate.

Many of the handsome Australian Acacias, or Wattles—of which more than four hundred species exist—exude gums. Certain species growing in the arid western areas yield a good gum arabic, but this cannot be collected economically. *A. pycnantha*, *A. mollissima*, *A. decurrens*, and other species give excellent tanning extracts; these tan-barks, however, can be grown and gathered more economically in South African plantations.

Many Australian conifers belong to *Callitris*, the genus *Pinus* being unknown in the indigenous flora. According to Baker and Smith [3, 13], the genus *Callitris* also underwent evolutionary changes in traversing the continent from west to east. *C. glauca*, a typical 'western' species, affords the best source of an Australian 'pine-needle' oil, containing pinene and bornyl acetate; but *C. tasmanica*, an 'eastern' species, yields an oil containing 60 per cent. of geranyl acetate, being, surprisingly, a conifer which might be worked economically for geraniol. Of other Australian conifers, *Araucaria cunninghamii* (Moreton Bay Pine) is a magnificent timber tree; *Agathis robusta* (Queensland Kauri) gives an oleo-resin which is the most economic Australian source of a turpentine; and *Dacrydium franklini* (Huon Pine) furnishes a timber very resistant to insects, possibly because it contains methyl-eugenol. Unfortunately, before the advent of scientific forestry in Australia, there was a reckless 'cutting out' by skilled axe-men of these unique and magnificent species, without replanting.

To sum up: the myrtaceous plants—*Eucalyptus* and its congeners—are remarkable for their wealth of essential oils; the Australian Wattles and 'Pines' are predominantly sources of astringent material. It is impracticable here to enumerate alkaloids, dyes, glucosides, saponins, starches, fibrous celluloses, and other important organic products which various investigators have isolated from Australian plants. Finally, however, space must be found for a mention of the dainty pink-petalled *Boronias* (Rutaceae), with their intriguing scents and interesting oils; of the Sassafras and Sandalwood trees; and of the Grass Trees, or 'black boys' (*Xanthorrhoea* spp.), renowned for a yellowish resin from which picric acid may be made.

Phytochemical and Chemical Problems.

A study of the Australian flora presents many attractive problems to the botanist and the organic chemist. The botanist, sometimes unable to go so far as the chemist in the differentiation of plant forms, will ask where a species ends and a variety begins. An interesting example is provided by *E. dives*, the type form of which shows a maximum proportion of more than 50 per cent. of piperitone in its oil. This is a species of high commercial value, and yet botanically the type form is inseparable from three varietal forms, in which the proportion of piperitone dwindles from about 20 per cent. to vanishing point, with an increase of phellandrene in one variety and the development of about 25 to 75 per cent. of cineole in the other two [6]. To what extent can chemistry serve in the classification of living forms?

The admirable name *Eucalyptus* was synthesized by L'Heritier in 1788 from the Greek *eu* (well) and *kalyptos* (covered), the allusion being to a protective lid or operculum which covers the inner part of the flower and falls off when the stamens reach maturity. For this and other reasons, Baker and Smith considered that cross-fertilization occurs very rarely in the genus under natural conditions. Botanist and chemist alike would be interested to learn the effect of carefully controlled hybridization upon the chemical composition of eucalyptus oils. How would the chemical factors be inherited? Would it be possible to breed forms producing essential oils of particular value?

Some problems of a more purely chemical nature may be illustrated by referring to the ketone piperitone, which occurs in more than twenty *Eucalyptus* species, invariably in a laevo-rotatory or 'left-handed' (*l*) form. In 1921, J. L. Simonsen [12], working independently at Dehra Dun, India, discovered dextro-rotatory or 'right-handed' (*d*) piperitone in the oil of an Indian grass, *Andropogon jwarancusa*. These two piperitones, of the southern and northern hemispheres, are identical, except that their molecules are related as object and distinct mirror-image. A systematic study of the two forms of piperitone, begun at Sydney and continued at St. Andrews [5, 9], has thrown much light upon chemical and stereochemical problems in the terpene group, besides leading to ideas of biochemical significance.

Firstly, by means of a network of delicate reactions, piperitone has been used as a source of each of the four menthols. Theoretically, each kind should exist in a 'right-' and a 'left-handed' form, together with a so-called *dl*-form composed of equal amounts of the two. As an outcome of this work, all of them have now been brought within reach of the chemist. One of the twelve forms (*l*-menthol) is identical with natural menthol from oil of peppermint (*Mentha piperita*).

Secondly, it has been found possible to proceed, by laboratory processes, from the 'left-handed' Australian piperitone to the 'right-handed' Indian piperitone, a stereochemical achievement of great interest.

Lastly, these chemical and stereochemical researches offer a clue to the biochemical relationships of the constituents of the Australian and Indian oils concerned. Baker and Smith held that the open-chain compound geraniol passed into *Eucalyptus* from the older genus *Angophora*, and probably runs through the whole genus, although often present only in small amounts. This view being accepted, geraniol is now presumed to function in *Eucalyptus* as the precursor of piperitol, piperitone, and phellandrene. A detailed theoretical scheme has been advanced, according to which the reactions take a slightly different turn in the Indian grasses, leading thereby from geraniol to piperitol and piperitone, with carene in place of phellandrene. The possibility of the two series of chemical reactions is clear, and some of the steps have been realized in the laboratory since the theory was first put forward; but in what way the plants discriminate between the 'left-handed' and 'right-handed' molecules remains obscure.

'The excessively delicate control of the molecular mechanism which is here implied appears to be a prerogative of the living organism. The organic chemist is powerless to effect such subtle differentiations by the artificial methods of the laboratory. At the present stage of our knowledge, the finer manifestations of organic synthesis appear to be inseparably bound up with vital processes' [9].

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[10] —— Prelude to chemistry. G. Bell & Sons, London. 1936. pp. xxiv + 328 + plates.

[11] —— Textbook of organic chemistry. London. 1943. p. 623.

[12] SIMONSEN, J. L. The essential oil from *Andropogon iwarancusa*, Jones, and the constitution of piperitone. *J. chem. Soc.* 119 (2), 1921 (1644).

[13] SMITH, H. G. Some chemical characteristics of the Australian vegetation. *Rep. Aust. Ass. Adv. Sci.* 16, 1923 (201).

[14] —— *et al.* The botanical and chemical characters of the Eucalypts and their correlation. *85th Rep. Brit. Ass.*

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. MATHEMATICAL AND STATISTICAL ANALYSIS

01.7. FORSAITH, C. C. **Statistics for foresters.** *Tech. Publ. N.Y. St. Coll. For.* No. 62, 1943. pp. 69.

This bulletin is mainly concerned with the methods used in elementary statistical analysis for the description of population distributions. Short reference is also made to the use of the Chi Square Test for goodness of fit and to the determination of correlations. The bulletin is evidently intended for the use of those who have had only an elementary introduction to statistical method and to the principles which underlie it. As in other publications of this type, but little space is given to the underlying theory or to an explanation of the circumstances under which a particular statistic can usefully be employed. On the other hand, the descriptions of methods are clear and the examples used in illustration are well set out and easy to follow. The bulletin can be commended to all who are in need of such descriptions and examples. W. R. D.

01.7 : 12.19 : 12.26–8. WILLIAMS, C. B. **Some applications of the logarithmic series and the index of diversity to ecological problems.** *J. Ecol.* 32, 1944 (1–44). [Rothamsted Exp. Sta., Harpenden, Herts.]

The paper describes the application of a logarithmic series to a number of problems of the division of individuals into species and of species into genera.

The series, first suggested by R. A. Fisher in this connexion, is

$$n_1, \frac{n_1}{2}x, \frac{n_1}{3}x^2, \frac{n_1}{4}x^4, \text{ etc.},$$

where n_1 is the number of groups with one unit and x is constant less than unity. Unlike the hyperbolic series, which had previously been considered to apply to some of the cases discussed, the logarithmic series is convergent: both the number of groups (e.g. species) and the number of units (e.g. individuals) can be summed. When several samples are taken from a population containing a number of species it is found that the ratio n_1/x is constant and, as it is therefore a characteristic of the population, it has been called the index of diversity.

The logarithmic series is found to fit extremely well to a large number of frequency series drawn from insects, birds, butterflies and plants, except that there is a slight tendency for the calculated n_1 to be below the observed.

It also fits well, sometimes extremely well, to the number of genera with different numbers of species in standard classifications of groups of both animals and plants.

The conception of the index of diversity is applied to problems of the number of species of plants on different areas, and to the comparison of floras of different areas with interesting results.

A classification is given of the 171 families of dicotyledons according to their index of diversity to stimulate a discussion as to which may be the factors which bring about differences and resemblance in this index. In general, the families with large numbers of species and of genera have a large index of diversity, but there may be a very big range of index in families of approximately the same size. *From author's summary.*

02. HANDBOOKS. DICTIONARIES

02.1 (73) : 06.1 : 07.1–2 : 09.4 (71 : 73). GILL, T., and DOWLING, E. C. (Compilers). **The forestry directory.** American Tree Association, Washington, D.C. 1943. pp. x + 411. Price $2.00.

Detailed information is given on the functions of Federal, State and other organizations that are concerned with the various aspects of forestry in the United States, including conservation and education. Information is also given on forestry in Canada and in parts of tropical America. Forest statistics are given by states, and for Canada by provinces.

02.4. **Forestry-timber-lumber. English-French, French-English, vocabulary of terms used in operations.** Compiled in the Office of the [U.S.] General Purchasing Agent. 1944. pp. 24.

05. PERIODICALS

05 : 2 : 60.31 : 91.1 : 98.2. GRÜNWOLDT, F. Répertoire international des periodiques forestiers: sylviculture, économie du bois, protection de la nature et chasse. **[International catalogue of forest periodicals: silviculture, timber management, and nature and game preservation.]** *Silvae Orbis* No. 1, 1940. pp. xix + 205. [F.]

The catalogue lists, by countries, the serial publications dealing with forestry, the timber industry, hunting, and the protection of nature. Such publications include not only periodicals proper, but also annual reports, bulletins, pamphlets, and various other kinds of publications that are of a serial nature. The total number of publications listed is 1,256, of which about 400 are periodicals proper. For countries possessing no serial publications on forestry, or only very few, non-forestry publications in which articles on forestry usually appear have been included. As far as possible, the following information is given for each publication: full title, abridged title, issuing institution, editorial office with address, editor's name, publisher's name, date of foundation, frequency of issue, shape, and price. The preface and introduction are in French, German, English, Spanish and Italian. It appears from the index that a large number of the publications are of recent origin, which reflects the extension of scientific forestry in recent years.

05.3. *Annual Reports*

05.3 (54.8) : 86. INDIA. **Administration report, Cochin Forest Department. 1118 M.E. (17th August, 1942 to 16th August, 1943).** Cochin State Forest Department. 1943. pp. 35 + 21 appendixes.

05.3 (54.87) : 07.2 : 2. CEYLON. **Silvicultural research administration 1942.** [Ceylon Forest Department.] 1943. pp. 8.

05.3 (66.4). SIERRA LEONE. **Forestry report for the year 1942.** Govt. Printer, Freetown. 1943. pp. 15.

05.3 (71). CANADA. **Twenty-sixth annual report of the National Research Council of Canada, 1942–43.** National Research Council, Ottawa. [1943?] pp. 35 + 38. *N.R.C.* 1169. [E.F.]

05.3 (71.1). BRITISH COLUMBIA. **Report of the Forest Branch for the year ended December 31st, 1943.** King's Printer, Victoria, B.C. 1944. pp. 71 + plates.

05.3 (71.21). MANITOBA. **Annual report of the Forest Service, fiscal year ending April 30th, 1943.** Department of Mines and Natural Resources, Manitoba. [1943?] pp. 36.

05.3 (71.21). SASKATCHEWAN. **Annual report of the Department of Natural Resources of the Province of Saskatchewan for the fiscal year ended April 30, 1943.** King's Printer, Regina. 1944. pp. 117.

05.3 (71.5). NEW BRUNSWICK. **107th annual report of the Department of Lands and Mines of the Province of New Brunswick for the year ended 31st October, 1943.** Department of Lands and Mines, Fredericton, N.B. 1944. pp. 124.

05.3 (71.6). NOVA SCOTIA. **Report of the Department of Lands and Forests, 1943.** King's Printer, Halifax, N.S. 1944. pp. 103 + plates.

05.3 (729.7). TRINIDAD. **Report of the Governing Body and the Principal's report to December 31st, 1943, and the accounts for the year ended August 31st, 1943.** Imperial College of Tropical Agriculture, St. Augustine, Trinidad. 1944. pp. 24.

05.3 (74.6). CONNECTICUT. **Agricultural Experiment Station. Annual report for the year ending October 31, 1942.** *Bull. Conn. agric. Exp. Sta.* No. 468, 1943 (57–95). I.I.E.

05.3 (75.1). DELAWARE. **Annual report of the State Forester to the State Forestry Commission for the fiscal year (July 1, 1942 to June 30, 1943).** State Forestry Department, Dover, Delaware. 1943. pp. 36.

05.3 (945). VICTORIA. **Forests Commission of Victoria, Australia. Twenty-fourth annual report, financial year 1942–43.** Govt. Printer, Melbourne. 1944. pp. 28.

06. SOCIETIES. ASSOCIATIONS

06.1 (43.1–5). Documents sur la situation juridique du Centre International de Sylviculture (C.I.S.). **[Documents on the legal position of the International Centre of Silviculture (C.I.S.).]** Centre International de Sylviculture. [n.d.] pp. 20. [F.]

Documents defining the constitution, internal organization, and the status of the personnel of the C.I.S.

06.1 (43.1–5) : 02.2. PETITMERMET, M. L'activité du Centre International de Sylviculture. **[The activities of the International Centre of Silviculture.]** *J. for. suisse* 94, 1943 (257–62). [F.]

The publications of the C.I.S. include the quarterly journal *Intersylva*, monographs on various subjects (ten published and eight in the press), and a forest bibliography of which the 1941 volume has been published.

07. EDUCATION AND RESEARCH

07.1 : 98.2 (73). FRITZ, E. **Apprentice training for lumber industry executives.** *Loggers Handbook 1942* 2, 1943 (65–8). [Pacific Logging Congress, Portland, Oregon.]

07.1–2 (43.1–5). KÖSTLER, J. **The present state of the science of forestry in Germany. A survey of the period, 1933–1940.** *Res. and Progress, Berl.* 9 (2), 1943 (75–101). Biol. Abstr. 18 (11798).

There are 50 research institutes or laboratories at the 6 German forestry schools (Eberswalde, Göttingen, Tharandt, Freiburg, Munich, Vienna) and numerous other special institutes and laboratories (listed) that deal with forestry and forest products. The work of these organizations during the 8 years is reviewed, with citations of several hundred of the resulting papers and books.

07.2 (97) : 05.3. GREAT BRITAIN. **Colonial Research Committee: first annual report, 1943–44.** H.M. Stationery Office, York House, Kingsway, London, W.C.2. 1944. pp. 11.

07.2 (410). GREAT BRITAIN. **Scientific research and development: statement of the existing Government organization.** H.M. Stationery Office, London, W.C.2. 1944. pp. 12.

A brief account is given of the existing Government machinery for the promotion of scientific research and development in Great Britain.

09.2. *Pre-history*

09.2 (42.1–8). GODWIN, H. **Age and origin of the 'Breckland' heaths of East Anglia.** *Nature, Lond.* 154, 1944 (6–7). [Botany School, Cambridge.]

From the results of pollen analysis at Hockham Mere on the northern edge of the East Anglian Breckland it appears that a change from forest to heath has taken place in this area since Neolithic times, similar to that recorded recently by Iversson for certain parts of Denmark [cf. *For. Abstr.* 6 (5)]. Although there is no direct evidence by what mechanism this change was brought about, it seems probable, in view of Iversson's conclusions, that the change was due to forest clearance by Neolithic man. The important flint mines at Grimes Graves were operating at this time, and there is reason to think that there may have been considerable colonization in the Breckland area.

09.4. *Forest Statistics*

09.4 (494). Statistique forestière suisse 1941. **[Swiss forest statistics for 1941.]** *J. for. suisse* 94, 1943 (158–61). [F.]

09.4 (71) : 98.1. **[Survey of the forest resources of Canada.]** Royal Bank of Canada, Montreal. 1944. pp. [4].

A brief survey is made of the forest resources of Canada and production statistics are given for the pulp and paper and the lumber industries. Notes are included on types of forests, increment and depletion, and on the present forest conditions and practices in each of the nine provinces. The following statistics for the country as a whole cover the last pre-war year.

In 1942 the wood-products group of industries accounted for $352 million of Canada's total favourable balance of trade for that year.

Industry	*Establishments*	*Capital invested*	*Number of employees*	*Value of products*
›ods operations .	—	$198 million	98,000*	$158 million
ımber . . .	3,941	86 million	32,399	100 million
lp and paper . .	100	598 million	31,016	208 million

* On a man-year basis, distributed over nearly 300,000 persons.

·4 (72) : 09.7 : 98.1. MARTÍNEZ, J. G. Desarrollo y lización de los recursos forestales de Mexico. **evelopment and utilization of the forest resources of :xico.**] *Carib. For.* 5, 1944 (124–35). [Span.e.]
The trees of the forests of Mexico, which cover 086,106 ha. or about 12 per cent. of the land area, ı be divided into two general classes, viz. those ›ducing precious woods and those producing com- ›n woods and other products. The former occur as ıttered individuals or in groups. The latter are ınd throughout all forest regions and are the principal ırce of the wood products of Mexico. The common ›ods may be divided into two groups: hard woods, ed in construction, for railway sleepers and for ning timber, and soft woods, which generally yield ly minor produce, such as dyes, medicines, rubber, In addition, 406,000 cords of pulpwood and 5¾ million cords of fuelwood were used in the State. The total net saw-timber increment in 1938 was 1·66 billion bd. ft. for softwoods and 637 million bd. ft. for hardwoods, the commodity drain being 1·69 billion and 530 million bd. ft. respectively.

In North Carolina nearly 3,000 industrial plants depend directly upon the forest for raw material, and the value of their production in 1938 was about $55 million.

Apart from the analysis of forest resources and the wood-using industries of the State, this report discusses possibilities for increasing the utility of the forests, and the action that private owners, the State, and the Federal Government may take towards improving forest conditions in North Carolina.

Climatic zone	*Quality of wood*	*Area ha.*	*Number of trees per ha.*	*Total number of trees*
Tropical . . .	Precious	15,280,935	5·0	76,404,675
	Common			
	Hard		50·0	764,046,750
	Soft		90·0	1,375,284,150
Sub-tropical . .	Precious	3,922,532	0·5	1,961,266
	Common			
	Soft		80·0	313,802,560
Temperate . .	Precious	4,413,843	0·1	441,384
	Common			
	Hard		100·0	441,384,300
	Soft		10·0	44,138,430
Coolest . . .	Common	2,468,796		
	Soft		145·0	257,954,420

—From author's summary.

ls, and fruit. The above table gives some indication the forest resources of Mexico.

.4 (75.6) : 98.1–2. CRUIKSHANK, J. W. **North Caro- a forest resources and industries.** *Misc. Publ. U.S. ep. Agric.* No. 533, 1944. pp. iv + 76 + map.
The information in this bulletin is based on the ıdings of the U.S. Forest Survey. The forest area of orth Carolina is over 18 million acres or 59 per cent. the total area of the State. About one-third of the nber area is in hardwood and two-thirds in Pine, 26 r cent. of the area being in the Loblolly Pine (*Pinus eda*) type. Some 53 per cent. of the forest land is cupied by stands of saw-timber size, and 45 per cent. second-growth stands under saw-timber size.
In 1938 the saw-timber volume was nearly 44 llion bd. ft., 37 per cent. of this being Loblolly ne. Production in that year included 1·4 billion l. ft. of lumber and 110 million bd. ft. of veneer.

09.4 (79.5 : 79.7) : 98.1 : 33.32. COWLIN, R. W. **Pulp- wood supply for Pacific northwest mills.** *Paper Ind.* 25, 1943 (713–6). [Pacific Northwest Forest & Range Exp. Sta.] L.S.

In western Oregon and western Washington there are 23 active pulp mills with a total capacity of approxi- mately 5,940 tons per 24-hour day. In 1942 pulpwood consumption in this region was nearly 2½ million cords and wood-pulp production nearly 2 million tons.

Pulpwood resources of the region total more than 34 billion cu. ft. of standing timber by species as follows: Western Hemlock (*Tsuga heterophylla*), 21 billion cu. ft., Balsam Fir (*Abies balsamea*), 9½ billion cu. ft., Sitka Spruce (*Picea sitchensis*), 2 billion cu. ft., and 1½ billion cu. ft. of miscellaneous species. Current annual depletion at the 1941–42 level is estimated at about 600 million cu. ft. and current annual growth at about 300 million cu. ft. Both of these figures can be markedly

affected by a number of factors and it is concluded that the supply of raw material for the Pacific Northwest pulp industry can be assured if satisfactory forest management is practised. Present methods of, and some of the problems relating to, harvesting and transportation of pulpwood in the region are discussed briefly.

09.7. *Monographs of Individual Forest Regions*

09.7 (492) : 96.5 : 91.1 : 09.4 : 11.62.1 : 98.1. VAN STEIJN, J. A. **L'économie forestière et l'approvisionnement en bois des Pays-Bas. [Forest economy and timber supply in the Netherlands.]** *Intersylva* 2, 1942 (29–38). [F.g.e.span.ital.]

This paper begins with a brief historical account of government control over forestry and forest management in the Netherlands. At present the State manages directly 59,500 ha. of waste or uncultivated areas destined for afforestation, and is responsible for the enforcement of laws and decrees concerned with forest management and economy, forestry training, and nature protection. The State is also concerned with the collection and compilation of forest statistics for the total wooded area, i.e. 256,000 ha. or 7·8 per cent. of the total area of the country.

The afforestation of waste and uncultivated land is of primary importance, both in increasing the area of forest and creating employment; sand-dune fixation has been an important aspect of this work. In recent years, the idea of the protection of nature by the State has been considerably developed, and the part played by the State Forest Administration in this connexion is important, together with the activities of the Society for the Preservation of Natural Monuments and of the affiliated provincial societies.

Home timber production varies from 600,000 to 900,000 cu. m. and imports amount to some 5 million cu. m. per annum. Great efforts are being made to increase production, notably in private forests.

09.7 (54) : 12.19. NAIK, P. M. **A glimpse into the forests of India.** *Poona agric. Coll. Mag.* 34, 1943 (159–62). C.G.B.

Stress is laid on the importance of forests for the well-being of India and the consequent necessity for forest conservation and proper management. The divergent conditions of climate, soil and topography lead to a wide range of forest types, from tropical to alpine. Only about 20 per cent. of the area of British India is forested, the distribution of forests among the provinces being very uneven. The author recommends an extension of tree planting in India as well as better stocking of existing forests.

09.7 (61 : 64 : 65) : 09.4. GAUTIER, M. Les ressources forestières de l'Afrique du Nord. **[The forest resources of North Africa.]** *Rev. int. du Bois* 10 (98), 1943 (30–6). [F.] Biol. Abstr. 18 (11795).

The composition of the forests of Morocco, Algeria and Tunisia is described, with notes on their extent, distribution, and economic value.

09.7 (71.4). WILSON, E. **An analysis of the forest situation in eastern townships.** *For. québec.* 6, 1943 (167–71). [E.]

Notes are given on forestry conditions in eastern Quebec.

09.7 (85) : 98.1 : 12.26–8 : 91.3 : 11.13. KNUCHEL, H. Forstliche Probleme in den Anden und Küstengebieten Perus. **[Forest problems in the Andes and the coastal districts of Peru.]** *Schweiz. Z. Forstw.* 94, 1943 (351–6). [G.]

A general note. The mining industry of Peru at present uses large quantities of the timber of *Eucalyptus globulus*, which is produced in irrigated plantations on the sierra at various elevations ranging up to 3,700 m. The Forest Service, a section of the Ministry of Agriculture, was created 3 years ago and is concerned largely with propaganda and the establishment of experimental plantations of fast-growing trees.

A very interesting experiment has been carried out on one of the 'lomas' of the coast. These are sandy hills of desert character, less than 500 m. high. They receive during the winter (June to October) some 200 mm. precipitation from coastal fogs. An experimental plantation of 100,000 trees has shown surprisingly fine growth, with the height increment averaging 100 cm. per annum. From preliminary measurements it appears that precipitation (from fog) beneath the trees is anything up to 800 mm., as against the 200 mm. in the open.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.4. *Soil*

11.4 (54) : 21.3. LAURIE, M. V. **[Soil problems.]** Paper (I). **General note on soil problems.** With appendix. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 16, 1941 (384–9, 389–92).

11.4 (54). GUPTA, R. S. **[Soil problems.]** Paper (II). **A note on the work done in the Soil Section, Forest Research Institute during 1938–39 and the bearing of soil research on practical forestry.** With report of debate on *Item* 16. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 16, 1941 (392–9, 399–408).

These papers and the active debate which followed are concerned with the general question of soil problems in Indian forestry and the particular investigations on which the Soil Chemist at the Forest Research Institute could be most efficiently employed.

11.43. Biology of Soil, including Mycorrhiza

11.43.1 : 01.6. KELLY, A. P. **Additions to the literature of mycorrhizae.** Landenberg, Pa. 1944. pp. 10. [*Suppl.* No. 7 to *The Literature of Mycorrhizae.*]

A current bibliography with abstracts.

11.43.1 : 21.3 : 11.47. WILDE, S. A. **Mycorrhizae and silviculture.** *J. For.* 42, 1944 (290–1). [Univ. of Wisconsin.]

In commenting on a recent paper on 'Tree nutrition and soil fertility' by Neilson-Jones [cf. *For. Abstr.* 5 (233)], the writer takes exception to the suggestions that (*a*) in certain soils the presence of toxins inhibits the production of mycorrhizae and is thus responsible for poor growth of Pine seedlings; (*b*) Pine nutrition on difficult sites depends more on degree to which the soil favours the development of Hymenomycetes than on

abundance of available bases. It is pointed out (*a*) 'de-toxination' has not been found to be a essary preliminary step to the successful inoculation rees on prairie soils where the nutrition of mycorr-e-free woody plants is made difficult by a number of ors; (*b*) there are no transitional gradations in the corrhizal relationship—it must be either complete, n nutrition proceeds normally, or entirely absent, n growth usually ceases in the initial stage of elopment.

43.1 : 12.25 : 12.11.12. BJÖRKMAN, E. **The effect trangulation on the formation of mycorrhiza in Pine.** *nsk bot. Tidskr.* 38, 1944 (1–14). [E.e.] O.B.D.

The formation of ectotrophic mycorrhizae on 3-r-old Pine (*Pinus sylvestris*) plants was almost com-ely inhibited during the growth period subsequent to ngulation of the main stem about 5 cm. above und level in the spring. Normal plants used as ntrols showed prolific mycorrhizal growth, while porarily strangled plants developed fresh conducting ue after their release, with a consequent renewal of corrhizal development. The author believes that inhibition of mycorrhizal growth is closely connected h the shortage of soluble carbohydrates in the Pine ts due to interruption in the supply from the shoot he products of photosynthesis.

43.1 : 12.26–8. SCHUSTER, C. E., STEPHENSON, R. E., d EVENDEN, W. **Mycorrhizas of Filbert and Walnut es in Oregon orchards.** *Bot. Gaz.* 105, 1944 (388–92). .S. Bureau of Plant Industry, Corvallis, Oregon.] B.D.

Examination of the roots of Filbert and Walnut trees Oregon orchards revealed that ectotrophic mycor-zae were generally present on the roots of *Corylus ellana*, while endotrophic mycorrhizae were common Walnut, regardless of the type, depth, or physical chemical properties of the soil. In both cases the ycorrhizal condition was characterized by shortened rminal root growth and by clubbed and shortened erals.

Under field conditions no evidence could be found t in deep fertile soils mycorrhizae are either neces-y or detrimental to the development of large pro-ctive trees, or that they contribute at all towards the cline of weak, devitalized trees on poor, shallow soils.

43.2 (213) : 13.2. STRICKLAND, A. H. **The arthro-d fauna of some tropical soils, with notes on the hniques applicable to entomological soil surveys.** *op. Agric., Trin.* 21, 1944 (107–14). [Imperial College Tropical Agriculture.]

11.47. Maintenance of Favourable Soil Conditions

47.13 : 23.24 : 12.26–8. DENUYL, D. **Effect of tilizer on planted Black Locust.** *J. For.* 42, 1944 50–1). [Purdue Univ. Agricultural Exp. Sta.]

In planting Black Locust (*Robinia pseudoacacia*) on a mpact subsoil deficient in plant nutrients, the applica-n of a complete fertilizer, 2–12–6, in each planting le at the rate of 1 tablespoon per plant, resulted in a rked increase in height and diameter growth and ot development in comparison with untreated con-ols. This effect of the fertilizer has continued for the ur years that measurements have been made.

11.6. *Hydrographical Conditions. Water and Soil Conservation*

11.62 : 91.3. HÄRTEL, O. Der Wasserhaushalt der Berggebiete. [**The water régime of mountain regions.**] *Cbl. gesamte Forstw.* 68, 1942 (197–9). [G.]

One of the chief aims of water management is the control and better distribution of run-off. This paper discusses the extent to which the water in mountain regions may be influenced by measures calculated to increase rainfall and decrease losses through run-off and other causes. Stress is laid on the importance of a forest cover as a factor in improving the water régime and in the prevention of erosion.

11.62.1 (47.2–3 : 47.6). BALLY, W. **Soil deterioration and soil conservation in the Union of Soviet Socialist Republics.** *Mon. Bull. agric. Sci. Pract., Rome* 34 (2), 1943 (37T–70T). *Repr.* from *Internat. Rev. Agric.* E.F.A.

11.62.1 (54.2). OWDEN, J. S. [**Erosion and forestry in India.**] Paper (I). **Erosion problems in Bihar.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 12, 1941 (319–21).

11.62.1 (54.2) : 97.1. NICHOLSON, J. W. [**Erosion and forestry in India.**] Paper (II). **Note on erosion problems in Orissa.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 12, 1941 (321–3).

11.62.11 (54) : 91.3. GORRIE, R. M. [**Erosion and forestry in India.**] Paper (III). **Soil erosion control.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 12, 1941 (323–8).

11.62.1 (54). LAURIE, M. V. [**Erosion and forestry in India.**] **Summary of points raised in the papers.** With report of debate. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 12, 1941 (328, 329–30).

It is emphasized that misuse of the land, as in the cultivation of erodible soils, the use of unsuitable crops, or the practice of shifting cultivation on slopes, is the main cause of erosion. Other causes are overgrazing, grazing by goats, firing grasslands for early fodder or, in some cases, uncontrolled grass-cutting. Removal of the initial causes is the first step and is usually primarily an administrative matter. J. W. Nicholson's paper stresses the need for proper land planning and for the land area of the country to be administered by a technically qualified department instead of being placed under revenue officers whose errors in allotment of land for cultivation and failure to control excessive grazing cause damage and financial loss. R. M. Gorrie's paper describes some of the activities of the co-operative branch of the civil administration in combating the causes of erosion and emphasizes how much can be done by securing the active co-operation of villagers. Actual control measures are (*a*) closure to grazing, or rotational grazing, (*b*) control of grass cutting, and (*c*) planting eroded slopes. J. S. Owden records experience in planting eroded areas in Bihar and shows the value of contour trenching for holding up moisture, and the success achieved with wattle-bunding and grass ropes pegged down with cuttings of trees that root easily. Seeding up with grass and *Tephrosia candida* or other nurse crops forms the first stage, tree planting being postponed until the cover is complete and sheet erosion is checked.

The Conference proposed a wide range of subjects for further investigation by silviculturists and suggested

administrative measures for dealing with erosion problems outside the scope of the Forest Department.

11.62.1 (54.2) : 11.2 : 12.26–8 : 91.3. WARREN, W. D. **[Contour trenching as a means of preventing run-off and improving locality factors.] An experiment to hold up run-off on tropical dry hill forest areas; its effect on vegetation and climate.** A summary. With report of debate. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 19, 1941 (445–54, 454–9).

This paper is a summary of an experiment begun in 1933 in a dry valley in Singhbhum district, Bihar, to determine the effect of contour trenching on the run-off, vegetation and local climate of a fourth quality Sal forest; the subject has been covered in several other papers [cf. *For. Abstr.* 4 (152); 5 (87)]. The conference, while agreeing that contour trenching is one method of checking run-off and minimizing floods, and may be of value in afforesting blank areas since it raises the moisture-content of the soil, concluded that the data presented by the Bihar experiment do not justify the claims made that contour trenching has appreciably affected the climate or the tree crop increment.

11.62.1 (68). AARTSEN, J. P. VAN. **Erosion and soil conservation in the Union of South Africa.** *Mon. Bull. agric. Sci. Pract.* 34 (5), 1943 (153T–201T). *Repr.* from *Internat. Rev. Agric.* E.F.A.

11.62.11 (51). LOWDERMILK, W. C. **Hwan Lung Shan, where China's history is written in the land.** *Soil Conserv.* 9, 1944 (203–7). [U.S. Soil Conservation Service.]

Originally the Hwan Lung Shan or Yellow Dragon Mountains in the Shensi Province of China were covered with forests of *Pinus tabulaeformis, P. burgeana, Sophora* spp., *Acer* spp., *Ulmus pumila, Zelkova sinica,* and various wild fruit trees, except on the drier, grass-covered ridges and on the Poplar-clad stream banks. More than a century ago intensive cultivation of the hill slopes and the clearing of the original vegetation led to such serious erosion that the area was almost completely abandoned during the Mohammedan rebellions of 1860 to 1870. Thereupon the natural vegetation began to reassert itself and once more erosion virtually ceased. Recently cultivation has again started in this area, and the clearing of hill slopes has set in motion another cycle of accelerated erosion. It is hoped by means of contour trenching and other soil conservation measures to reduce this erosion to a minimum. With this end in view an experimental demonstration project has been established in the area.

11.62.11 (68.9) : 43.11. TOPMAN, P. **Forests and rainfall.** *Nyasald. Quart. J.* 3 (3), 1943 (19–21). A.P.B.

Reference is made to benefits resulting from an experiment to check rapid run-off by means of contour trenching, described by Warren in the *Indian Forester* [cf. *For. Abstr.* 5 (87)]. In Nyasaland, run-off from land under grass and trees is usually much less than 50 per cent., and the construction of contour trenches to improve natural vegetation is generally unnecessary. Such improvement is best brought about by fire control. Run-off from areas burnt in July was only about half that from areas burnt in October. Complete fire protection is preferable, but the cost is usually prohibitive except in a few areas of relatively high value.

11.62.21 (494) : 23.13 : 38.62. KALBERMATTEN, J. DE. **Assainissement des forêts de la Vallée supérieure de la Gryonne. Résultats obtenu 8 ans après leur exécution [Drainage of the forests of the upper Gryonne Valley. Results obtained 8 years after carrying out (the operation).]** *J. for. suisse* 94, 1943 (217–20). [F.]

This article deals with the drainage of a vast area of forest in the commune of Gryon, situated at an altitude of 1400 to 1750 m. on glacial moraine containing many beds of clay which prevent the infiltration of water. Conditions unfavourable for tree growth also included damage to young plants by cattle browsing and the formation of numerous small water pockets. Amelioration consisted mainly in the closure of the area to grazing, and drainage by means of a network of open ditches. The latter operation was begun in 1935. Results were not immediate, but by 1938 a change in the herbaceous vegetation showed that conditions were beginning to improve. In the course of time increased regeneration has made planting unnecessary in some areas and numerous older trees are showing renewed vigour.

11.62.3. MÜLLER, R. Ueber einige Grundlagen der Fluss- und Wildbachverbauung. **[On some principles of river and stream training.]** *Schweiz. Z. Forstw.* 95, 1944 (11–25). [G.]

A note on the hydrological, physical, and engineering principles underlying work of stream regulation.

12. FOREST BOTANY. TREE SPECIES

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

12.11.1. *Metabolism. Plant Constituents. Sap Flow. Growth Substances. Reserve Materials*

12.11.1 : 12.14.5 : 12.14.8 : 31.3. ŠPIRK, L. **The extraction of fats and fatty substances from needles, wood and bark of trees.** *Chem. Listy* 35, 1941 (84–5). *Chem. Zbl.* II, 1941 (287–8). P.R.

Direct extraction of powdered wood and bark is not suited for the production of fat acids and fats because the concentration of the extract is too low. The fact that pretreatment with boiling water removes mannose, xylose, glucose and coniferyl alcohol results in more effective extraction. Derivatives of fat acids and compounds containing chemically bound fat must be hydrolyzed before extraction. Removal of resins yields fat acids of higher purity.

12.11.11 : 12.26–8. FREUDWEILER, R. **Several galenical preparations of *Aesculus hippocastanum* L.** *Hundert Jahre schweiz. Apoth.-Ver. 1843–1943 (Centenaire Soc. suisse pharm.)* 1943 (438–9). Chem. Abstr. 38 (1842). P.R.

Several extracts were prepared with 95 per cent. and 70 per cent. alcohol with and without $CaCO_3$. The stabilized tinctures contain a total solids content of 5·79–7·77 per cent., while the fluid extracts contain 19·52–21·7 per cent., the specific gravity and alcohol content varying with the concentration of the stabilizing solvent and the extractor used. The presence of glucosides could not be demonstrated by either biochemical methods or capillary luminescence analysis. Saponins are only slightly extracted. The hemolytic index and the foam index of the extracts were compared.

12.11.11 : 12.14.5 : 12.25. ORLOVA, I. M. **The chemical composition of Fir needles.** *Lesnaya Prom.* No. 1, 1941 (33–5). *Khim. Referat. Zhur.* 4 (9), 1941 (132). Chem. Abstr. 38 (1767). P.R.

Winter needles of Fir contain carbohydrates 31·0, nic substances 10·0, unhydrolyzable substances 14·5, ins and fats 9·5, and ash 4·5 per cent. The Fir- dle 'lignin' contains not more than 6 per cent. MeO, ile 12–16 per cent. is found in the lignin of Fir wood. rbon content varies from 57·8 to 60·8 per cent. The inic acid obtained from the needles contains 3·5 per nt. less of C and 4 per cent. more of O than Kiesel's inic acid.

11.11 : 12.14.5 : 12.14.7 : 34.26 : 12.26–8. SÜSSEN- TH, A. **Flowers, leaves and oil of the Linden.** *Dtsch. ilpfl.* 8, 1942 (109). Chem. Abstr. 38 (1607). P.R.

A review of the literature on the chemical composition flowers, leaves and oil.

11.12 : 12.25 : 12.11.13. FREELAND, R. O. **Appa- nt photosynthesis in some conifers during winter.** *Plant ysiol.* 19, 1944 (179–85). [Northwestern Univ. anston, Illinois.] O.B.D.

Field experiments were carried out in the vicinity of ke Michigan on the apparent photosynthesis of *Picea riana*, *Pinus sylvestris* and *Pinus nigra* var. *austriaca* ring the winter months. From the data obtained it is ncluded that apparent photosynthesis by these species y take place in this region at air temperatures down approximately – 6° C. Respiration appears to occur even lower temperatures.

11.12 : 12.25 : 12.26–8 : 11.15 : 12.11.23. KRAMER, J., and DECKER, J. P. **Relation between light intensity d rate of photosynthesis of Loblolly Pine and certain rdwoods.** *Plant Physiol.* 19, 1944 (350–8). [Duke niv., Durham, N. Carolina.] O.B.D.

Rates of photosynthesis of Loblolly Pine (*Pinus da*), Eastern Red Oak (*Quercus borealis maxima*), hite Oak (*Q. alba*), and Dogwood (*Cornus florida*) re determined for one-hour periods at approximately ° C. at various light intensities from 300 up to nearly ,000 foot-candles.

Photosynthesis of Loblolly Pine increased with light tensity up to the highest light intensity used, which is nost that of full sun. Photosynthesis of the three rdwood species reached its maximum at one-third or s of full sunlight and showed slight, but statistically significant, decreases at higher light intensities.

These results indicate that lack of sufficient light for aximum photosynthesis may be a significant factor the failure of Pine seedlings to become established der forest stands. Pine seedlings are probably able to manufacture enough food in the shade to velop sufficiently extensive root systems for the sorption of adequate water during periods of rought. Certain species of hardwood seedlings, on e other hand, are able to carry on relatively more notosynthesis in the shade and therefore can develop ore extensive root systems, probably thus enabling em to survive droughts which are fatal to Pine seed- ngs. *Authors' summary.*

11.13 : 11.15. WEINTRAUB, R. L. **Radiation and ant respiration.** *Bot. Rev.* 10, 1944 (383–459). mithsonian Institution, Washington, D.C.]

A review of the literature supports the conclusion at, under some conditions, an increase in the rate of pparent' respiration, as measured by gaseous ex- hange, may be induced by irradiation of various species plants and types of plant tissues. In the present mentary state of our knowledge it cannot be decided with certainty whether or not the observed stimulations are directly related to the 'true respiration'. Despite the long-continued interest in this problem the results thus far available are almost entirely of a descriptive nature, and in no single case has there been presented, as yet, a satisfactory elucidation of the mechanism involved. From a consideration of the diverse conditions and types of material with which an alteration of the gaseous exchange has been observed, it seems altogether likely, however, that such an effect may be the common end result produced by a variety of phenomena. *Author's summary.*

12.11.15. JARKOVAJA, L. M. **Changes in the content of growth substances due to interruption of the period of rest.** *C.R.* (*Doklady*) *Acad. Sci. U.R.S.S.* 23, 1939 (88–91). [E.] [Timiriazev Institute of Plant Physiology Academy of Sciences of the U.S.S.R.] O.R.S.

12.11.2. *Propagation. Growth. Development*

12.11.21 : 12.26–8. LARSON, G. C. **More on seedlings of Western Aspen.** *J. For.* 42, 1944 (452). [Uinta National Forest.]

[Cf. *For. Abstr.* 5 (235).] The writer records the finding of seedlings of Western Aspen (*Populus tremuloides aurea*) on the shore line of a reservoir in Uinta National Park, central Utah.

12.11.21. LEWIS, D. **Incompatibility in plants: its genetical and physiological synthesis.** *Nature, Lond.* 153, 1944 (575–8).

Failure of sexual reproduction in a plant is said to be due to incompatibility when fusion of the two gametic nuclei within the regular mating group is prevented for some reason not due to any defect in the nuclei themselves. Breeding experiments have shown that such incompatibility is always genetically determined and that it tends to prevent the fusion of nuclei from closely related parents. In flowering plants incompatibility may be broadly classified into two general systems: (1) incompatibility without heterostyly (where there are no differences in the floral morphology), and (2) incompatibility with heterostyly (where there is differentiation into long- and short-styled plants). Each of these systems is examined and discussed.

12.11.23 : 12.14.5. GAVRILOV, K. I. **Some data on the causes of formation of the cicatrization layer before the fall of leaves.** *C.R.* (*Doklady*) *Acad. Sci. U.R.S.S.* 23, 1939 (726–9). [E.] [Perm Medical Institute.] O.R.S.

Experiments on Ash (*Fraxinus excelsior*) to study the physiological factors involved in the formation of the cicatrization layer before leaf-fall revealed that the formation of such a layer is connected with the accumulation of B-hormones in its vicinity. The relative amount of the B-hormone rapidly increases as leaf-fall approaches and remains at a rather high level throughout the period of leaf shedding.

12.11.23 : 12.14.5 : 12.26–8. KRIEL, H. T. **Breaking the 'rest period' of deciduous trees.** *Fmg. S. Afr.* 18, 1943 (321–2). [Subtropical Horticultural Research Sta., Nelspruit.] L.S.

Preliminary investigations with peaches, plums and other trees have shown that the dormancy of flower and leaf buds may be broken by injecting the branches with a 2½-per-cent. solution of sodium thiosulphate in acid medium.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance*

12.11.3. Smith, H. H. **Recent studies on inheritance of quantitative characters in plants.** *Bot. Rev.* 10, 1944 (349–82).

12.11.3 : 12.26–8. Jensen, H. W. Um estudo citológico comparativo de Thalictrum e Ilex. [**A comparative cytological study of *Thalictrum* and *Ilex*.**] *Bragantia, S. Paulo* No. 3, 1943 (199–222). [Port.] Plant Breed. Abstr. 14 (1009).

The chromosome numbers of four species of *Thalictrum* and five species of *Ilex* from North Carolina were determined. Those of the *Ilex* species were as follows: *Ilex decidua*, $n = 20$; *I. monticola*, $n = 20$; *I. vomitoria*, $n = 20$; *I. opaca*, $n = 18$; and *I. verticillata*, $n = 18$. Meiotic irregularities in the form of lagging chromosomes were found either in the first or second divisions in all five species. They were never present in more than about 50 per cent. of the pollen mother cells examined. It is assumed that only the pollen which is produced from normal meiotic divisions effects fertilization, since the somatic chromosome numbers of all five species is constant. The author considers that the evolution of sex chromosomes in the higher plants proceeds via a heterochromosome stage such as is seen in *Ilex* at the present time; here, the heterochromosomes are associated with meiotic irregularities, which arise perhaps from previous disturbances caused by interspecific hybridization.

12.11.3 : 12.26–8. Pantulu, J. V. **Further chromosome numbers in the Caesalpiniaceae.** *Curr. Sci.* 12, 1943 (274). [Maharaja's College, Vizianagram.] L.S.

The author records the chromosome number of three species (*Amherstia nobilis* Wall., *Saraca indica* Linn. and *Brownea* sp.). The number $n = 12$, which he found in each case, agrees with that previously reported for the genus *Caesalpinia*, *Cercis canadensis*, *Cassia fistula*, *C. sophora*, *C. alata* and *C. tomentosa*.

12.11.3 : 12.26–8. Suto, T. **Meiotic chromosomes in *Populus nigra* and *Toisusu cardiophylla*.** *Jap. J. Genet.* No. 16, 1938 (304–6). Plant Breed. Abstr. 14 (1007).

Owing to its resemblances to *Populus*, *Toisusu cardiophylla* has been proposed by Professor Kimura as the type of a new genus, though this plant was formerly classed under *Salix*.

This paper is a study of the behaviour of the bivalents in *P. nigra* L. and *Toisusu* (*Salix*) *cardiophylla* Kimura ($n = 19$) with special reference to the long disputed problem of unequal chromosome pairs and secondary pairing in the latter genus.

From his observations the writer concludes that: (1) Secondary pairing may occur between chromosomes of the same or of different sizes; (2) if secondary pairing is interpreted as indicating kinship between plants of the same origin, bivalents in the Willow family could be traced back to a group of 7 chromosome pairs, the Willow being then regarded as a secondary polyploid. No such group was, however, actually observed even where secondary pairing was most frequent.

12.11.3 (410). **Application of genetics to plant and animal breeding.** *Nature, Lond.* 153, 1944 (780–3).

Report on a symposium held in London on April 13, 1944, by the Genetical Society. One of the speakers, Professor H. G. Champion of the Imperial Forestry Institute, Oxford, indicated the great scope for the practical application of the genetical knowledge that can be gained about important forest trees in Britain. He pointed out that 'it is exceptionally wide in Great Britain owing to the general reliance on plantations for regenerating or creating forests, and to the widespread use of exotic species. The consequences of mistakes made in selection of the stock used in any locality will carry on for at least a tree generation. Relatively little intensive research has been done on forest trees; but there is ample evidence that the majority of the factors most important to foresters both in growing their forests and in the quality and quantity of their final yield vary to an important extent with genetic constitution. The older work has been mainly the comparison in various localities of results obtained with collections of seed made in different parts of the geographic range of the species concerned. This work has demonstrated that differences often occur so marked that on the right choice might depend outstanding success or complete failure. Such studies cover all the common species but have given particular attention to *Pinus sylvestris*. More recently, attention has been paid to controlled pollination both to ensure homogeneity, and to study the results of crossing both within a species and between species. Examples of commercially important hybrids and polyploids are available, notably with *Larix* and *Populus*. Genetical research on forest trees and the practical application of results present special difficulties as compared with similar work on other plants. These have probably been over-emphasized, but are the main cause of the relative neglect under which the subject has suffered at the hands of botanists and practical foresters. These difficulties were briefly reviewed. For research, they derive from the large size of the tree unit, the late maturation and inaccessibility of the flowering branches, and the fact that growth in crops is essential for proper assessment. In application of results, these same hindrances are involved, and, furthermore, most forest trees cannot easily be multiplied vegetatively. Considerable progress has already been made in surmounting these obstacles and it is thought that many of the problems should be capable of solution; organized attack with official support is strongly to be recommended'.

12.11.3 (485). Föreningen för växtförädling av skogsträd. [**Association for the Breeding of Forest Trees.**] *Skogen* 31, 1944 (113–4). [Sw.]

In this brief press report on the annual meeting held at Gillet in 1943, the Association's work at the Värmland and Norrland affiliated stations on the production of improved races of forest trees whose superior characters are genetically conditioned is mentioned.

Branch stations have been set up at Brunsberg in Värmland, and Dalfors in Dalarana, and another at Backe is being moved to Sundmo (in Ångermanland), where a large plant breeding institute for all Norrland is to be established.

The work of the stations has consisted mainly in surveying and collection as well as nursery work and field experiments for progeny testing. M. L. C. W.

12.11.3 (485) : 23.23.19 : 12.25 : 23.24. Sjöström, H. Rationalisering av frö- och plantanskaffningen vid skogsodling. [**Rationalizing the supply of seed and plants in silviculture.**] *Skogen* 30, 1943 (207–9). [Sw.]

his article is a condensed report of a lecture which
ls with:—
) The difficulties of providing adequate high-grade
l for the large-scale extension and improvement of
dish forests, with special reference to the conditions
requirements in Norrland.
2) The incidence of seed production in Pine and
uce, mention being made of climate, locality,
mination capacity, etc. as factors in the production
uitable seed for different regions, O. Heikinheimo's
k on forest seed production in Finland being cited
elevant to Swedish conditions as well.
3) The importance of genotype in the selection of
e trees for high-grade seed production and the value
genetic research in forest improvement.
4) Planting as the main method of cultivation in the
n lying regions of Norrland, especially as regards
e which is more sensitive than Spruce to removal
m one area to another.
5) Measures to improve élite trees including progeny
ls, due reference being made to the work of B.
quist, H. Jensen, and O. Langlet.
6) The raising of self-sown plants as material for
st cultivation, the advantages and disadvantages of
ng such plants, and the potential role of such 'natural
nt nurseries' in practical forestry.
In conclusion, it was pointed out that, in addition to
uring the use of good seed and good plants, the
nnique of cultivation should be examined with a
w to obtaining the best and most economical results.

M. L. C. W.

11.3 (485) : 12.11.15. Ullén, G. Skogsvårds-
eningens exkursion till Skåne. [**Excursion of the
vicultural Society to Scania.**] *Skogen* 30, 1943
5–7). [Sw.]
During this tour a demonstration was given on the
rk at Ekebo on giant Aspens and Birch, and the
hniques of bottle grafting and strangulation com-
ed with hormone treatment, which have been used
hasten reproduction in breeding forest trees.

M. L. C. W.

11.3 : 12.26–8 (931 : 94) : 12.19. Arter, hybrider
n skogar av sydbokslaktet (*Nothofagus*) i Nya Zee-
d och Australien. [**Species, hybrids and woods of
false Beech (*Nothofagus*) in New Zealand and Aus-
lia.**] *Svensk bot. Tidskr.* 38, 1944 (123–6). C.G.B.
On the basis of palaeontological and other evidence
author suggests that the decrease in the range of
iation and the present differentiation of species of
gus in different parts of the northern hemisphere and
different groups of *Nothofagus* species in various
rts of the southern hemisphere can be explained by
extinction of certain genes in the different areas
cupied by these two genera. There are no indica-
ns of divergent evolution in the accepted sense, i.e.
vards a greater multiplicity of forms within both
nera.
The distribution of *Nothofagus* species in the vegeta-
n of New Zealand and Australia is discussed.
Observations in parts of New Zealand show that
menziesii does not cross with any other species, but
t the species *N. solandri*, *N. truncata*, *N. fusca* and
cliffortioides form a commiscuum, in which the very
ried hybrids *N. solandri* × *N. truncata* and *N.
ffortioides* × *N. fusca* are easily identified.

M. L. C. W.

12.14. Organography. Morphology. Anatomy. Histology

12.14.4 : 12.25. Wylie, R. B. **A note on axis restoration in a gymnosperm tree.** *Proc. Iowa Acad. Sci. 1942* 49, 1942 (123–5). [State Univ. of Iowa, Iowa City.]

An instance is recorded of the successful substitution of a lateral branch for a lost apical shoot of a White Pine (*Pinus strobus*). The lateral branch was bent upwards and fastened in an upright position, the supporting splint being removed after two years' growth. After seven years' growth the lateral branch had assumed the form and dimensions of a true apical shoot.

12.14.5 : 12.26–8. Bailey, I. W., and Nast, C. G. **The comparative morphology of the Winteraceae. IV. Anatomy of the node and vascularization of the leaf.** *J. Arnold Arbor.* 25, 1944 (215–21 + plates). [Harvard University.]

The nodal anatomy of the Winteraceae is remarkably stereotyped and constant throughout the family, the nodes being always of the trilacunar type despite the size of the leaf. The vascularization of the petiole and lamina is, however, variable and rather unstable. The authors discuss the trends of structural specialization within the family. Simpler types of foliar vascularization tend to occur in most species of *Drimys* and *Pseudowintera*, and complex and more highly specialized ones in certain species of *Bubbia*, *Belliolum*, and particularly of *Exospermum* and *Zygogynum*. In the last-named four genera there is a conspicuous trend towards intense sclerification of both vegetative and floral organs, along with the formation of very coarsely veined leaves.

12.14.5 : 12.26–8. Bailey, I. W., and Nast, C. G. **The comparative morphology of the Winteraceae. V. Foliar epidermis and sclerenchyma.** *J. Arnold Arbor.* 25, 1944 (342–8 + plates).

The authors discuss the origin and composition of the grey or white glaucescence visible on many dried leaf specimens of the Winteraceae, the significance of the stomatal plugs, and certain general trends of specialization in leaf structure.

A note is included on the papillate lower epidermis found in some specimens of *Drimys brasiliensis*.

12.14.5 : 12.26–8. Egler, F. E. **Some statistics of *Achras zapota* leaves, British Honduras.** *Bull. Torrey bot. Cl.* 71, 1944 (235–45). [Chicle Development Company Exp. Sta.] O.B.D.

The importance of *Achras zapota* as the source of the chicle of commerce as well as the value locally of the fruit and timber of *Achras* make the recognition of species, strains and types of this genus a matter of practical significance. Leaf shape is frequently an important factor in the segregation of taxonomic entities, and even in normal leaves of the Sapodilla differences in leaf form deserve further investigation. This paper presents some statistics on normal leaf variation in a population of *Achras zapota*.

12.14.5 : 12.26–8. Wylie, R. B. **The dwarf leaf of *Cercis canadensis*.** *Proc. Iowa Acad. Sci. 1942* 49, 1942 (117–22). [State Univ. of Iowa, Iowa City.] L.S.

A comparative mophological examination was made of three leaves of *Cercis canadensis*—a 'sun' leaf, a 'shade' leaf and a 'dwarf' leaf. Unlike some dwarf pinnate leaves, the dwarf palmate leaf of this species appeared to be a fairly normal shade leaf except that

in total vein length per unit area it ranked above the large shade leaf, while in the relative amount of spongy mesophyll it stood next to the sun leaf. The study of more leaves per category would be necessary, however, to obtain completely reliable data.

12.14.6 : 12.25 : 12.11.3. ÅHLMAN, S. Hur tidigt kan anlag för smaleller bredkronighet konstateras? [**How early can the tendency to narrow or broad crown be determined?**] *Skogen* 30, 1943 (231). [Sw.]

The possibility of distinguishing by measurement of the top and lateral shoots between narrow- and broad-crowned Spruce or Pine as early as the third year of growth should be experimentally tested. M. L. C. W.

12.14.7. RICKETT, H. W. **The classification of inflorescences.** *Bot. Rev.* 10, 1944 (187–231). [New York Botanical Garden.]

Confusion has arisen in the terminology used to describe various types of inflorescences largely owing to the fact that names proposed under the influence of theories since discredited have frequently been retained. In this paper the author makes an attempt to find a suitable basis for the re-classification of inflorescences, starting with the dichasium, used in its original sense of a flower cluster which 'originates in a single peduncle by "dichotomous" branching immediately beneath a terminal flower, and develops by a repetition of the same apparent dichotomy in each lateral branch'.

The various terms at present in general use are discussed and reasons given for or against their retention.

12.14.7 : 12.25. WILDE, M. H. **A new interpretation of coniferous cones. I. Podocarpaceae (*Podocarpus*).** *Ann. Bot., Lond.* (*n.s.*) 8, 1944 (1–41). O.B.D.

A morphological study of male cones in *Podocarpus* has shown that two species, *P. spicatus* and *P. andinus*, possess compound male and female fertile branches similar to those of the Palaeozoic Cordaitales. The female fertile branches bear spirally arranged bracts; in the axil of each is a single ovule surrounded by an epimatium (ovuliferous scale), which represents, in reduced form, a secondary determinate fertile shoot and its appendages. The male fertile branch likewise bears spirally arranged bracts; in the axil of each is a small, sessile male cone, a relatively unreduced secondary, determinate fertile shoot.

Modifications of the male fertile branch within the genus consists of the following steps: (*a*) internodal reduction forming primary clusters of cones; (*b*) continued internodal reduction with loss of all fertile branch units except the single terminal one which has a short stalk and retains only four to six persistent sterile bracts.

Subsequent internodal shortening of the secondary vegetative branch brings the axillary male fertile branches (reduced to a single terminal unit) together into secondary clusters. Ultimately these clusters may be reduced to a single cone.

Internodal reduction in the primary vegetative branch may also bring secondary clusters of male cones together into tertiary clusters.

Species in which marked vegetative branch reduction has not occurred are characterized by foliar reduction.

A preliminary survey of male cone arrangement in other families of Coniferae has shown that in these also a similar reduction has occurred, with some differences in morphological detail. ***From author's summary.***

12.14.7 : 12.26–8. BANERJI, I. **The development of the female gametophyte and floss in *Bombax malabaricum* DC.** *Proc. Indian Acad. Sci.* 16, Sect. B, 1943 (205–11). [Calcutta Univ.] L.S.

12.14.7 : 12.26–8. KAUSIK, S. B. **Studies in the Proteaceae. VII. The endosperm of *Grevillea robusta* Cunn., with special reference to the structure and development of the vermiform appendage.** *Proc. Indian Acad. Sci.* 16, Sect. B, 1943 (121–40 + plates). [Univ. of Mysore, Central College, Bangalore.] L.S.

12.19. Geographical Distribution. Plant Geography and Sociology

12.19 : 12.25–8 (47.3). TASKAEVA, N. YA. K poznaniyu lesov sredney chasti Molotovskoy oblasti. [**Contribution to the knowledge of the forests of the central part of the Molotov region.**] *Bot. Zh. S.S.S.R.* 28, 1943 (248–55). [Russ.f.] O.B.D.

Ecological data on some of the forests of this region, consisting largely of stands of Silver Fir and Spruce; Silver Fir, Spruce, and Lime; Silver Fir, Spruce, and Birch; and Pine.

12.19 (43.1–5) : 12.25 : 12.26–8 : 23.21. TSCHERMAK. Unterschiede des Waldkleides auf der Aussen- und Innenabdachung des Gebirges—auch im südlichen Schwarzwald. [**Differences of forest cover on the outer and inner slopes of the mountain—also in the southern Black Forest.**] *Cbl. gesamte Forstw.* 69, 1943 (58–60). [G.]

A comparison of the vegetation found on the western and eastern slopes of the southern Black Forest, with particular reference to the distribution of conifers and Beech. Generally speaking, the eastern slopes are unsuitable climatically for the growth of the latter species, and its introduction, even on better soils, is not recommended.

12.19 : 12.26–8 : 13.15 : 13.2. DOWDY, W. W. **A community study of a disturbed deciduous forest area near Cleveland, Ohio, with special reference to invertebrates.** *Ecol. Monogr.* 14, 1944 (193–222). [Lincoln Univ., Mo.]

A biotic study of five plant communities situated mainly on Mahoning silty clay loam about 14 miles east of the city limits of Cleveland. Particular reference is made to the invertebrate fauna. The communities represent distinct stages in the natural plant succession of the area: *Pontentilla/Solidago/Rumex* associes, *Solidago/Agrostis/Daucus* associes, *Quercus/Carya* associes, *Acer/Tilia/Sambucus* associes, and *Fagus/Acer* association.

The invertebrates were studied by means of soil samples and net sweeps. In all five communities Coleoptera outnumbered other species of invertebrate fauna present. The *Fagus/Acer* association was the only community in which dipterous species occurred in relatively large numbers.

12.19 : 12.26–8 (494) : 11.4. ETTER, H. Pflanzensoziologische und bodenkundliche Studien an schweizerischen Laubwäldern. [**Plant sociology and soil science studies in Swiss broadleaf forests.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 23, 1943 (7–132 + suppl. tbls.). [G.g.f.] [Eidg. Technische Hochschule, Zürich; Eidg. Anstalt für das forstliche Versuchswesen, Zürich.] E.F.A.

An ecological study of the relics of natural Oak vegetation found in the Swiss Plateau adjoining the

Jura, which include various sub-associations of *Querceto-Carpinetum*, and *Querceto-Betuletum* woods.

12.19.1. *Regional Floras, including Check Lists*

12.19.1 (7). CURTIS, C. C., and BAUSOR, S. C. **The complete guide to North American trees.** New Home Library, New York. 1943. pp. 337 + illus. E.S.R. 90 (737).

The three main sections of this popular manual deal, respectively, with the trees of the northeastern, southern, and western regions of North America; included are regional keys and keys to the three main groups of trees (cone-bearing, broadleaved, and Monocotyledons), as well as general explanations and suggestions.

12.19.1 (71.11) : 12.25–8. MOSS, E. H. **The prairie and associated vegetation of southwestern Alberta.** *Canad. J. Res.* 22, Sect. C, 1944 (11–31).

In this account of the floristic composition and ecology of the chief plant communities in the region, three major grassland types are recognized and correlated with climatic factors, topography, and soil colour zones. Of some 250 species and varieties of vascular plants found in these grassland communities, approximately 125 are regarded as either common or characteristic. Poplar and coniferous vegetation is considered in relation to climate, physical features, and the associated grassland. The Limber Pine (*Pinus flexilis*) and Douglas Fir communities of rocky ridges in the 'parkland' are described. Prairie and Poplar associations are compared with corresponding vegetational types described for other regions. Brief consideration is given to probable migration routes of certain species, and to current fluctuations and trends in the flora of the region. *From author's summary.*

12.19.1 (71.4) : 12.25–8 : 21.3. ROUSSEAU, L. Z. Les arbres du Quebec. Comment les identifier facilement. **[The trees of Quebec. How to identify them easily.]** *Bull. Minist. Terres For.* No. 4, 1944. pp. 22. [F.]

This bulletin includes a simple key for the identification of the forest trees of Quebec and short notes on the botanical character and soil requirements of each species.

12.19.1 (729.6) : 12.25–9. BEARD, J. S. **Provisional list of trees and shrubs of the Lesser Antilles.** *Carib. For.* 5, 1944 (48–67). [E.span.]

Four hundred and twenty-eight species are listed and their distribution indicated.

12.19.1–2 (729.7) : 11.2–4). BEARD, J. S. **The natural vegetation of the Island of Tobago, British West Indies.** *Ecol. Monogr.* 14, 1944 (135–63). [Colonial Forest Service, Trinidad and Tobago.]

After a review of environmental factors (including physiography, climate and soils), the author discusses the flora of Tobago, which is entirely continental in its affinities, having migrated to the island during Eocene or Oligocene times when Tobago was joined to the mainland. There are four major plant formations: (1) Mangrove woodland (*Rhizophora mangle/Avicennia nitida/Laguncularia racemosa* association); (2) littoral woodland (*Hippomane mancinella/Coccoloba uvifera* association); (3) deciduous seasonal forest (*Bursera simaruba/Lonchocarpus domingensis* association); and (4) rain forest, which includes (*a*) lowland rain forest (*Carapa guianensis/Andira inermis* association), (*b*) lower montane rain forest (*Byrsonima spicata/Licania biglandulosa* association), and (*c*) xerophytic rain forest (*Manilkara bidentata/Guettarda scabra* association). Each plant formation is described, and a list is given of the native trees recorded from the island. The only conifer listed is *Podocarpus coriaceus* Rich.

12.19.1 (74.7) : 12.24–8 : 21. EGLER, F. E. **The ferns and flowering plants of the Clark Reservation, Onondaga County, New York.** *Tech. Publ. N.Y. St. Coll. For.* No. 61, 1943. pp. 64.

An annotated list of the ferns and flowering plants of the Clark Reservation situated in Onondaga County, five miles south of Syracuse. The vegetation indicates that the area is within, but close to the cold limits of, the Oak/Hickory zone. 'The most mesic type of forest is a Maple/Basswood community, with a small proportion of Hemlock and of Beech especially in the ravines. The admixture of American and Slippery Elms, Butternut, White Ash, Red Oak, Shagbark Hickory, and Bitternut is apparently due to establishment of these species in old openings. Young stands of *Ostrya* are found on cut-over lands, where this tree appears to seed in very readily. Closed stands of Cedar, sometimes mixed with Hemlock, probably arose during a period of continuous grazing, since these species are highly unpalatable. Open stands of Shagbark Hickory may have arisen during a period of intermittent grazing, since the tree is one of the less palatable of the hardwood trees.'

The following information is given for each species in the list: (1) the plant community in which the species is found, (2) soil type, (3) light conditions required (for immature trees), (4) the frequency of occurrence and the abundance of the species in the community where it occurs, (5) the plant collection which authenticates the record, and (6) page references for 'Gray's New Manual of Botany' by Robinson and Fernald, 1908, and for 'Illustrated flora of the northern States and Canada' by Britton and Brown, 1936.

12.19.2. *Forest Types*

12.19.2 (47.2–6). TOLMACHEV, A. I. K voprosu o proiskhozhdenii taygi kak zonal'nogo rastilel'nogo landshafta. **[On the question of the origin of the taiga as a zonal vegetation type.]** *Sovetsk Bot.* No. 4, 1943 (8–23). [Russ.] O.B.D.

12.19.3. *Other Vegetation Types*

12.19.3 : 12.22 (729.9). STEHLÉ, H. Les petites associations epiphilles en forêt hygro-sciaphile aux Antilles françaises. **[The small epiphytic associations in the hygro-sciaphile forest of the French Antilles.]** *Carib. For.* 5, 1944 (136–7). [F.]

Additional notes on the associations described in a previous article [cf. *For. Abstr.* 5 (241)].

12.2. *Special [Systematic] Botany*

12.2. ENGLER, A., *et al.* Die natürlichen Pflanzenfamilien nebst ihren Gattungen und wichtigeren Arten, insbesondere den Nutzpflanzen. **[The natural plant families together with their genera and more important species, particularly economic plants.]** Verlag von Wilhelm Engelmann, Leipzig. 1b (2nd ed.), 1942. pp. 232. 5aI (2nd ed.), 1943. pp. 360. 20b (2nd ed.), 1942. pp. 411. [G.]

The three volumes deal with Schizophyceae (1b), the structure and biology of Eumycetes (5aI), and the sub-series Celastrineae and Icacinineae of the Sapindales (20b).

12.21. Fungi

12.21 : 31.42.11. BADCOCK, E. C. **Methods for obtaining fructifications of wood-rotting fungi in culture.** *Trans. Brit. mycol. Soc.* 26, 1943 (127–32 + plate). [Forest Products Research Laboratory, Princes Risborough, Bucks.] I.M.I.

Methods are described for cultivating wood-rotting fungi on a medium consisting of sawdust to which various nutrients are added, so as to produce in fairly short periods fructifications which are sufficiently typical of the species to be readily recognized.

The conditions most favourable for the production of sporophores by wood-rotting fungi in culture are briefly discussed. *From author's summary.*

12.21 : 12.11.1. BLAIR, I. D. **Behaviour of the fungus *Rhizoctonia solani* Kühn in the soil.** *Ann. appl. Biol.* 30, 1943 (118–27). [Rothamsted Exp. Sta., Harpenden, Herts.] L.S.

12.21 (7) : 31.42.11. BRASFIELD, T. W. **The Dacrymycetaceae.** *J. Miss. Acad. Sci.* 2, 1940 (36–7). E.S.R. 90 (790).

A brief conspectus of this family of non-pathogenic wood-rotting fungi based on a 4-year study, 26 North American species being recognized.

12.21 : 12.14.5 : 12.26–8. INGOLD, C. T. **Further observations on aquatic Hyphomycetes of decaying leaves.** *Trans. Brit. mycol. Soc.* 26, 1943 (104–15 + plates). [University College, Leicester.] I.M.I.

Of the sixteen species of Hyphomycetes already reported as occurring on decaying submerged leaves of Alder [cf. *For. Abstr.* 5 (171)], thirteen have been found also on decaying Oak leaves in a nearby Leicestershire stream, along with two other species, *Dendrospora erecta*, n.gen., n.sp., and *Piricularia aquatica*, n.sp. *Tricladium anomalum*, n.sp., was found on decaying submerged leaves of *Typha latifolia* from a pond. The species are described and the distribution of aquatic Hyphomycetes is briefly discussed.

12.21 (74.7) : 31.42.1 LOWE, J. L. **The Polyporaceae of New York State (except *Poria*).** *Tech. Publ. N.Y. St. Coll. For.* No. 60, 1942. pp. 128.

Keys are given to the genera and species of the Polyporaceae known to occur within or near the borders of New York State, together with descriptions of 141 species representing the genera *Polyporus*, *Favolus*, *Trametes*, *Daedalea*, *Lenzites*, *Cyclomyces*, *Fomes* and *Ganoderma*.

Classification is according to the Friesian system, although it is recognized that some arrangement along more natural lines would be highly desirable. Most of the species described are saprophytic or parasitic upon wood.

12.21 : 33.36.1 : 33.31. PIZER, N. H., and GLASSCOCK, H. H. **Experiments to determine the effect of certain wood preservatives on the growth and cropping of the cultivated mushroom (*Psalliota campestris*).** *Ann. appl. Biol.* 30, 1943 (128–31). [South-Eastern Agricultural College, Wye, Kent.] L.S.

12.21 : 44.3 : 31.42.1 : 11.43.1. RAMSBOTTOM, J. **Fungi and modern affairs.** *Nature, Lond.* 153, 1944 (636–41).

The author discusses the importance of fungi as a source of food, as causal agents of certain diseases in plants and animals and in the decay of stored products, and as economically useful materials for the production of chemical substances such as citric and gluconic acids and penicillin. Mention is made of the part played by fungi in the decay of trees and timber, and of the function of the mycorrhizal fungi in association with some forest trees.

12.23. Bryophyta

12.23 : 12.19.2 (76.3) : 12.26–8. MACKANESS, F. P. **Bryophytes of the Live Oak forest.** *Proc. Louisiana Acad. Sci.* 6, 1942 (48–9). Biol. Abstr. 18 (9968).

12.25. Gymnosperms

12.25 : 21.61 : 23.27 : 45.3 : 13.2. **Irish Juniper.** *Amer. Nurserym.* 79 (7), 1944 (26–7).

A note on the form and habit of Irish Juniper (*Juniperus communis* var. *hibernica*), a species attractive as an ornamental only in its early stages. The Juniper webworm (*Phalonia rutilana*) has recently become a serious pest of all the closely compact upright varieties of the common Juniper. Spraying with a solution of lime-sulphur and arsenate of lead is recommended as a control measure.

12.25 : 21.61 : 12.19. DE VALL, W. B. **The taxonomic status of *Pinus caribaea* Mor.** *Proc. Fla. Acad. Sci. 1940*, 5, 1941 (121–32). [Univ. of Florida.] L.S.

A review of the taxonomic characters of the species *Pinus caribaea* Mor. (Slash Pine) which separate it from the closely related *P. palustris* Mill. (Swamp Pine), with particular reference to features which do or do not substantiate the classification used by Small in his 'Manual of the Southeastern Flora' (New York, 1933); in this he distinguishes between Longleaf Pine (*Pinus australis* Michx. f.), Swamp Pine and Slash Pine. Data are included on cone, needle, and seedling characters, and on growth habit and distribution.

12.25 (410). HOWARD, A. L. **The Cedar tree.** *Nature, Lond.* 153, 1944 (595–9).

Although the name 'Cedar' is loosely applied to trees of various genera, the true Cedars belong to the one genus (*Cedrus*) and show marked similarity of structure. None is indigenous to Great Britain, although they are frequently grown there as ornamentals. The author quotes and discusses historical references to Cedar trees and timber.

12.25 (499) : 12.19 : 21.61 : 21.11 : 23.24 : 31.2. HOFMANN, A. Die Zypresse auf den ägäischen Inseln. [***Cupressus sempervirens* L. on the Aegean Islands.**] *Z. Weltforstwirt.* 10, 1943 (246–58). [G.e.f.]

The Aegean Islands are approximately in the centre of the area of distribution of this characteristically Mediterranean species. There are two varieties—*stricta* and *horizontalis*. As far as is known the first variety is never found in natural stands, though sometimes it is naturally propagated from existing plantations. Var. *horizontalis*, on the other hand, grows spontaneously in many places in the eastern Mediterranean, and it would seem that this is the original form, the other being a garden variety cultivated from early antiquity. Both varieties are found in Rhodes. Var. *stricta* has been introduced recently and is grown in shelterbelts, for ornamental purposes, and sometimes for the production of poles. Var. *horizontalis* covers approximately 4,000 ha. or 8 per cent. of the wooded area of Rhodes. It grows mostly in small stands and prefers deep, fresh soils. On the best sites it reaches at the age of 30 years a height of 16–18 m. and a d.b.h. of 28–30 cm. The wood of Cypress is strong, elastic, of

medium hardness, and easily worked. It does not warp or shrink and is very durable. The growth rings are of even width, and there seems to be little difference in colour between sapwood and heartwood. The average density of air-dry wood was found to be 0·742. The wood is used for building timber and in joinery, carpentry, etc. Cypress trees are shade-bearing in early youth, later on they become moderate light-demanders. Planting can be done most successfully in autumn using transplants grown 1 year in a nursery and 1–2 years in pots.

12.25 (79.3) : 12.19.2 : 21. REVEAL, J. L. **Single-leaf Pinon and Utah Juniper woodlands of western Nevada.** *J. For.* 42, 1944 (276–8). [Soil Conservation Service, Sebastopol, Calif.]

New data are given on stand and tree characteristics for the two species Single-leaf Piñon (*Pinus monophylla*) and Utah Juniper (*Juniperus utahensis*), which are of major economic importance in the wood economy in the Great Basin region of western North America where they are used extensively for fence posts and fuelwood.

12.25–8 (494). Sur les variétés de nos essences forestières. **[On the varieties of our forest trees.]** *J. for. suisse* 93, 1942 (253–4). [F.]

The author lists a number of *lusi*, forms, and varieties of Norway Spruce, Silver Fir, Scots Pine, Yew, Beech, Oak, Sycamore, Ash, and Cherry observed in Switzerland.

12.25–8 (86) : 33.12. DANIEL, H. Algunas especies maderables de Colombia. **[Some timber species from Colombia.]** *Carib. For.* 5, 1944 (119–23). [Span.e.]

Species having timber that is suitable for carpentry work and which are found in the Department of Antioquia in the Magdalena valley include *Aniba perutilis, Swietenia macrophylla, Cedrela mexicana, Cariniana pyriformis, Myroxylon balsamum, Godoya antioquiensis*, Carano, a species not identified with certainty, *Astronium graveolens*, and several species called Guayacán, comprising *Bulnesia arborea, Tabebuia chrysantha, Guaiacum officinale*, and *T. pentaphylla*.

12.26–8. Dicotyledons

12.26–8. BAEHNI, C. Les sections du genre *Ponteria*. **[The sections of the genus *Ponteria*.]** *C.R. Soc. Phys. Hist. nat. Genève* 58 (2), 1941 (144–5). [F.] [Jardin Bot., Genève.] Biol. Abstr. 18 (3182).

The creation of a new system of classification for the Sapotaceae by the author [*Candollea* 7, 1938 (394–508)] has necessitated the grouping of about 500 species under the generic name *Ponteria*. There are 13 sections defined with the range of the various species designated.

12.26–8. CRONQUIST, A. **Studies in the Simaroubaceae—II. The genus *Simarouba*.** *Bull. Torrey bot. Cl.* 71, 1944 (226–34). [New York Botanical Garden, N.Y.] O.B.D.

The genus *Simarouba* Aubl. consists of trees or shrubs with alternate pinnately compound leaves. Six species and six varieties (including four new varieties) are described in this paper. The relationship between the various species is indicated.

12.26–8. WALKER, E. H. **A revision of *Distylium* and *Sycopsis* (Hamamelidaceae).** *J. Arnold Arbor.* 25, 1944 (319–41). U.S. National Herbarium, Washington, D.C.

This revision, although clarifying the position within the two genera, is to be considered somewhat tentative because several species are represented only by very inadequate collections and some important specimens have not been available for study owing to war conditions.

The species of both *Distylium* and *Sycopsis* are either trees or shrubs. Several, if not all, of the species of *Distylium* show a marked tendency towards variability in both vegetative and reproductive parts. The genus *Sycopsis* differs from *Distylium* mainly in the elongated receptacle which forms a tube completely covering the ovary and either growing with the developing ovary or splitting irregularly and forming a cup around the base of the fruit. The species of *Sycopsis* are much more distinct from one another than are those of *Distylium*, and there is more consistent variation in their inflorescences.

Descriptions are given of 12 species of *Distylium*, together with notes on 3 species insufficiently known. *Sycopsis* is represented by 6 species.

12.26–8 : 12.19. ZABKA, J. Taxonomické poznámky o olši a jejím geografickém rozšíření. **[Taxonomic notes on Alder and its geographic distribution.]** *Lesnická Práce* 21 (1), 1942 (10–20). [Cz.g.] Biol. Abstr. 18 (7092).

Two subgenera of *Alnus* are distinguished: Alnobetula, with 1 species, *A. viridis*; and Gymnothyrsus, with 8 species, *A. cordata, A. subcordata, A. japonica, A. incana, A. rubra, A. tenuifolia, A. rugosa*, and *A. glutinosa*.

12.26–8 (729.1) : 23.24 : 21 : 45.3 : 13.2. FORS, A. J. Notas sobre la silvicultura del Cedro, *Cedrela mexicana* Roem. **[Notes on the silviculture of the Cedar, *Cedrela mexicana* Roem.]** *Carib. For.* 5, 1944 (115–8). [Span.e.]

Since 1923 the Cuban Government has encouraged afforestation by establishing forest tree nurseries and by providing subsidies for the planting of Cedar and other commercial tree species. However, there has been no technical supervision and results of plantation work with Cedar have been doubtful or negative. The plantations established are generally pure and cover a small area. They develop well during the first two or three years, after which height growth stops, they appear weak, and become branchy as a result of attacks by *Hypsipyla grandella*. As a general rule Cedar has been planted on soils that have been cultivated for a long time. Some plantations have been started between Plantains, others under forest shade. Cuban experience indicates that (1) many isolated Cedars, planted or natural, grow with remarkable speed and show good form; (2) young Cedars require an abundance of nutrients; (3) Cedar planted under forest shade stops growing because of competition, primarily for light; (4) if planted on fertile soils generally considered too arid, Cedar grows well only under the shade of Algarrobos; (5) when a plantation is pure and very dense, no fast-growing dominants or co-dominants develop, but instead the entire plantation stagnates; (6) pure Cedar plantations do not generally form a canopy sufficiently dense to eliminate grasses and to make possible the rapid formation of humus. *From author's summary.*

12.26–8 (410) : 31.2. HOWARD, A. L. **The Ash tree.** *Nature, Lond.* 154, 1944 (27–9).

After reviewing certain superstitions connected with the Ash tree, the author discusses the properties and varied uses of the timber, and the size to which the Common Ash (*Fraxinus excelsior*) grows in Great Britain. Reference is made to the value of the Weeping

Ash (*F. excelsior* var. *pendula*) and the Manna Ash (*F. ornus*) as ornamentals.

12.26–8 (494). AUBERT, S. Essences feuillues 'accompagnantes' à la Vallée de Joux. ['Associated' broadleaf species in the Vallée de Joux.] *J. for. suisse* 95, 1944 (108–111). [F.]

The relatively unimportant broadleaf species found in this valley of the High Jura are commented upon briefly. They include *Ulmus montana, U. campestris Fraxinus excelsior, Populus tremula, Prunus avium, Pyrus silvestris,* and *P. communis.*

12.26–8 (51). HUI-LIN LI. **Additions to our knowledge of the flora of Hainan.** *J. Arnold Arbor.* 25, 1944 (206–14). [Arnold Arboretum, Harvard Univ.]

Of the eighteen plant species here listed as additions to the flora of Hainan Island, the following tree speces are recorded as new: *Reevesia lancifolia, Tutcheria ovalifolia, Symplocos hainanensis* and *S. howii.* Other trees included in the list are *Helicia silvicola, Photinia bethamiana* var. *obovata,* var. nov., *Lansium dubium, Styrax suberifolius* and *Symplocos punctato-marginata.*

12.26–8 (51). HUI-LIN LI. **New or noteworthy plants from southwestern China.** *J. Arnold Arbor.* 25, 1944 (299–318). [Arnold Arboretum, Harvard Univ.]

The descriptions and notes contained in this paper are based on selected specimens of plants mainly from Yunnan. New tree species are described from the following genera: *Dysoxylum* (4), *Aglaia* (2), *Dracontomelon* (1), *Mischocarpus* (1), *Ochrocarpus* (1), *Cornus* (2), *Styrax* (1), and *Linociera* (2).

12.26–8 (51). WEN-PEI FANG [Ed.] ***Icones plantarum Omeiensium.*** 1 (1), 1942. pp. iii + [106] + plates. [E. Chin.] [The National Szechwan University, Szechwan, China.]

Fifty plant species are described botanically in Chinese and in English, each species being illustrated by a full-page drawing of the flowering shoot. The following trees or large shrubs are dealt with in the present volume: *Carpinus fangiana, Magnolia officinalis, Michelia wilsonii, M. bodinieri, Illicium henryi, I. szechuanensis, Erythrina arborescens, Itea omeiensis, Staphylea holocarpa, Euscaphis japonica, Camptotheca acuminata, Davidia involucrata, Rhododendron stamineum, R. pingianum, R. calopytum, R. openshawianum, R. davidii, R. discolor, R. hemsleyanum, R. chengianum, Styrax hemsleyanus, S. japonicus, Rehderodendron macrocarpum* and *Pterostyrax hispidus.*

12.26–8 (54.2). JOSHI, K. D. **Two types of Babul (*Acacia arabica*).** With note by the Forest Botanist, F.R.I. *Indian For.* 70, 1944 (124–5 + plate).

The author describes two types of Babul (*Acacia arabica*) commonly found in the Aligarh and Agra districts of the United Provinces. The 'Bottle-Brush' tree differs noticeably from the common Babul in its growth form and appears to be a variety of the latter species. The Forest Botanist, F. R. I., tentatively identifies it as var. *cupressiformis* Stewart, which is also common in the Deccan, Gujrat, Sind, and the Jhelum district of the Punjab.

12.26–8 (54.3). VAHID, S. A. **Types of Babul (*Acacia arabica*).** *Indian For.* 70, 1944 (237–8).

In reply to a note by K. D. Joshi [cf. preceding abstract] the writer states that there are three recognized varieties of Babul (*Acacia arabica*) in Berar which come true to seed—Telia, Kauria (var. *vediana*) and Ramkanthia (var. *cupressiformis*). The last-named variety seems to correspond with the 'Bottle-Brush' Babul described in the previous note. For fuel it is inferior to the other two varieties, and, as it needs relatively more soil cultivation, it is less desirable as a forest crop.

12.26–8 (6) : 12.19 : 33.0 : 34.24 : 60.31. GREWE, F. Afrikanische Mangrovelandschaften. [African mangrove landscapes.] *Wiss. Veröff. dtsch. Mus. Länderk. Leipzig* N.F. 9, 1941 (103–77). [G.] *Abstr.* in *Z. Weltforstwirt.* 10, 1943 (276–9). [G.]

A general article. Africa occupies a special position among the mangrove regions of the world in that both the Indo-Pacific and the Atlantic types of mangrove occur on its shores. In the East-African area of distribution four associations can be distinguished: (1) the *Avicennietum* of the northern Red Sea coast; (2) the *Avicennieto-Rhizophoretum* of the southern Red Sea coast and the north and east coasts of Somaliland; (3) the fully developed *Rhizophoretum* of the coast and the river estuaries from the Lamu archipelago down to south of the mouth of the Zambezi; and (4) the *Rhizophoretum* found in southern Mozambique and in Natal that is poorer in species and more scattered. On the Atlantic coast of Africa the absence of coral reefs and of calm waters is unfavourable to the development of continuous lines of coastal mangroves, though there are important formations in several localities. The article discusses the use of mangrove woods in heavy construction (e.g. *Rhizophora mangle* and *R. mucronata*), for firewood (e.g. *Bruguiera gymnorrhiza* and *Ceriops candolleana*), in furniture-making (e.g. *Carapa moluccensis*), and for other purposes, and the use of mangrove bark as a source of tannin. Exploitation and management of African mangroves are reviewed with special reference to the period of German rule in East Africa.

12.26–8 (729). WADSWORTH, F. H. ***Tabebuia pallida* and *Tabebuia pentaphylla.*** *Carib. For.* 5, 1944 (99). [E.]

The *T. pallida* of Puerto Rico is quite distinct from the *T. pentaphylla* of Jamaica, and the latter is not a synonym of the former as has been suggested by some writers.

12.26–8 (74.8) : 44.3 : 12.21 : 21.1–2. KELLY, A. P. **The present status of American Chestnut in southeastern Pennsylvania.** Landenberg Laboratory, Landenberg, Pennsylvania. 1944. pp. 11.

Data are recorded from several Chestnut (*Castanea dentata*) plots in Pennsylvania showing the survival of this species in relation to the spread of the Chestnut blight fungus, *Endothia parasitica* (Murr.) Anderson. Best growth appears to be associated with water-retentive (but not waterlogged) soils. In recent years stump sprouts have decreased in numbers and old stumps have generally lost their sprouting capacity. Sprouts are much more susceptible to infection by *E. parasitica* than are seedlings; and the survival of the native Chestnut will depend to a large extent on the development of the seedlings now present in the woodlands, a process which would be greatly facilitated by the removal and burning of the comparatively small amount of spore-bearing material that now remains.

Habitat conditions inimical to Chestnut development are (1) drought, (2) continued deep shade, and (3) damage by spray gunshot, rabbits and deer.

12.26–8 (81). ALLEN, C. K. **A new species of *Licaria* from Brazil.** *Trop. Woods* No. 78, 1944 (4–5). [Arnold Arboretum, Harvard Univ.]

The new species is *Licaria duartei* Allen, a large forest tree with strongly fragrant wood found at an altitude of 1,000 m. in the National Park of Itatiaya, Rio de Janeiro. A botanical description is given, and the new species is compared with *L. appelii* (Mez) Kostermans from Minas Geraës, which it closely resembles.

12.26–8 (81). LEMOS FROES, R. DE. **Mahogany discovered in the State of Pará, Brazil.** With comment by B. E. Dahlgren. *Trop. Woods* No. 78, 1944 (1–3).

Although large quantities of Mahogany (*Swietenia*) have been exported from Brazil for some years, the timber has always been marked as coming from Peruvian territory. The author records the occurrence of large numbers of trees of this species in the Acre Territory (1936) and the State of Pará (1943).

12.26–8 (81 : 87) : 12.14.7. CROIZAT, L. **Three new Amazonian species of *Phyllanthus* L.** *Trop. Woods* No. 78, 1944 (5–9). [Arnold Arboretum, Harvard Univ.]

Of the three new species described two are shrubs and the third (*P. madeirensis* Croizat) a tree up to 46 ft. in height found on the plateau between Rio Livramento and Rio Ipixuna in the Province of Amazonas, Brazil.

A note is appended on the structure of the phyllanthoid inflorescence which is exemplified in *Phyllanthus* and allied genera.

12.26–8 (86) : 31.2. ACOSTA SOLÍS, M. El quishuar u olivo del páramo u olivo de los Incas, *Buddleia incana* H.B.K., fam. Loganiaceae. **[The Quishuar or Páramo Olive, or Olive of the Incas, *Buddleia incana* H.B.K., fam. Loganiaceae.]** *Flora, Ecuador* 3, 1943 (119–25). [Span.] *Abstr.* in *Trop. Woods* No. 78, 1944 (48).

The Quishuar is a little tree, rarely 15 ft. high, of common occurrence in the páramos of Ecuador where it frequently forms thickets. The wood, formerly used by the Incas in carving their idols, is strong and highly resistant to decay and insects. It also provides excellent fuel. The author recommends the planting of this species to supply additional sources of wood in treeless regions.

12.26–8 (86). LITTLE, E. L. ***Ochroma lagopus* Swartz, the name of the Balsa of Ecuador.** *Carib. For.* 5, 1944 (108–14). [E.e.span.] [U.S. Forest Service, Washington, D.C.]

The article summarizes the nomenclature of the genus *Ochroma*. The Balsa of Ecuador was named by Rowlee in 1919 *O. grandiflora*. However, herbarium material from Ecuador is not specifically different from West Indian material. The Balsa of the West Indies has two scientific names, both dating from 1788, *O. lagopus* Swartz and *O. pyramidale* (Cav.) Urban. As it is not known which name was published first, it seems best to retain for the Balsa of Ecuador the name *O. lagopus*, which was published originally in the present genus, was in universal use before 1920, and is still generally used in botanical publications.

12.26–8 (86). STEERE, W. C. *Joosia pulcherrima*, una nueva especie ecuatoriana de Rubiaceae. **[*J. pulcherrima*, a new species of Rubiaceae from Ecuador.]** *Flora, Ecuador* 3, 1943 (195–8). [Span.] *Abstr.* in *Trop. Woods* No. 78, 1944 (49).

The new species is a tree about 33 ft. high and 10 in. in diameter discovered by the author at an elevation of 2,000–2,200 m. in Provincia de Napo Pastaza, Cantón Sucumbios, Oriente, Ecuador. Because of its beautiful, jasmine-scented roseate flowers it is recommended for cultivation in parks and gardens.

12.26–8 (95). MERRILL, E. D., and PERRY, L. M. **Plantae Papuanae Archboldianae, XIV.** *J. Arnold Arbor.* 25, 1944 (183–205). [Arnold Arboretum, Harvard Univ.]

Among the trees of the Rubiaceae listed in this paper are the following new species: *Dolicholobium leptocarpum, D. ulawaense, Neonauclea versteeghii, N. perspicuinervia* and *Gardenia vernicosa*. Trees from the genera *Bikkia, Badusa, Nauclea*, and *Randia* are also recorded.

12.26–8 (95). SMITH, A. C. **Studies of Papuasian plants, VI.** *J. Arnold Arbor.* 25, 1944 (104–21, 222–98). [Arnold Arboretum, Harvard Univ.]

A comprehensive list of the Papuasian species of Elaeocarpaceae based mainly upon the general pattern of the family proposed by Schlechter [*Bot. Jb.* 54, 1916 (92–155)]. New tree species are recorded, with botanical descriptions, for each of the 5 Papuasian genera of the family: *Sericolea* (4), *Aceratium* (9), *Elaeocarpus* (30), *Dubouzetia* (2), and *Sloanea* (12). The final paper includes a key to the genera. About 187 species of Elaeocarpaceae are now known to occur in Papuasia. [The first part of this paper was abstracted separately in *For. Abstr.* 6 (18).]

12.29. Monocotyledons

12.29 : 44.1 : 97.3 : 34.21. ***Imperata cylindrica*: taxonomy, distribution, economic significance and control.** *Joint Publ. Imp. agric. Bur.* No. 7, 1944. pp. 63.

This widely-distributed tropical grass is frequently a serious pest in plantations of *Hevea brasiliensis, Tectona grandis*, and other species of economic importance. It spreads rapidly under favourable conditions of light and climate, and once established is very difficult to eradicate. The final chapter in this publication deals with control measures. For complete eradication, fire protection and the establishment of a shade-giving cover crop seem to offer the greatest promise of success.

12.29 : 60.31 : 21.9 : 24.21. SEN GUPTA, J. N. **[The management of Bamboos.]** With appendices and report of debate. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 26, 1941 (571–81, 582–5, 586–91).

Results of experiments carried out between 1916 and 1930 on methods of management of *Dendrocalamus strictus* in India were published in *Indian For. Rec.* (*n.s.*) *Silviculture* 2 (4), 1937. Since about 1931 a co-operative investigation on the effect of different felling cycles and treatments on the production and quality of culms has been in progress in five Provinces. The present paper summarizes the treatments allotted and prescribed for the experimental plots and discusses the provisional results which are also given in tabular form. Working experience of the treatments prescribed has revealed inherent defects, particularly in the regulation of the number of culms to be cut and the method of executing the fellings.

The age of full maturity of a culm is one year (except in the Punjab where it is 2 years) but annual culm production is a very variable quantity owing to climatic and other causes. If the intensity of fellings of mature culms is based on the number of new culms present at

each felling it leads to over-felling in years when previous culm-production was bad and to under-felling when it was good. It is suggested that investigations should be revised to study the actual numbers reserved, rather than in the proportion (or multiple), to determine the correct minimum number of mature culms retained per clump. As a workable compromise between a fixed minimum number of mature culms and a multiple of new culms present at each felling it is proposed that all 2-year-old culms should be identified and retained in addition to the year's culms, and if these two classes together are insufficient the deficiency should be made up from still older culms. Other suggestions are made in connexion with burning, conditions of overwood, congestion and longevity of individual culms.

In the debate K. Krishnaswamy dealt with felling rules, longevity, rainfall and thinning intensity, and overhead cover in Mysore. Ali Beg showed that the 2-year-old culm can be identified by its bracts and colour, and described a method of horsehoe cutting of clumps practised in Hyderabad.

The Conference decided to start work on comparable lines for *Bambusa arundinacia* and *Melocanna bambusoides* and to adopt the improvements in method learnt from past experience with *Dendrocalamus strictus*.

13. FOREST ZOOLOGY

13.1. *General Zoology*

13.14 : 13.2 : 45.3 : 12.26–8 (64). BLETON, C. A., and FIEUZET, L. Les parasites du peuplier au Maroc. 3e note. Sur la biologie de *Sarrothripus revayana* Scop. (Lépidoptère Cymbidae.) [**The parasites of Poplar in Morocco. 3rd note. On the biology of *Sarrothripus revayana* Scop. (Lepidoptera Cymbidae).**] *Bull. Soc. Sci. nat. Maroc.* No. 20, 1943 (99–102). R.A.E. 32A (232).

Sarrothripus revayana is rather rare in Morocco. Apart from *Populus nigra*, which is an important host, it has been observed on *Salix pedicellata* and the Cork Oak (*Quercus suber*), and probably feeds on other species of Poplar, Willow and Oak.

13.14 : 13.2 (71) : 45.3 : 12.26–8. BROWN, W. J. **The Canadian species of *Exema* and *Arthrochlamys* (Coleoptera, Chrysomelida).** *Canad. Ent.* 75, 1943 (119–31). I.I.E.

Descriptions are given of two species of *Exema* (*E. pennsylvanica* Pierce and *E. canadensis* Pierce) and seven species of *Arthrochlamys* (*A. cribripennis* (Lec.), *A. comptoniae*, n. sp., *A. eubati*, n. sp., *A. plicata* (Fab.), *A. alni*, n. sp., *A. bebbianae*, n. sp., and *A. chamaedaphnes*, n. sp.) found in Canada. The species of *Exema* are closely allied to those of *Arthrochlamys* and are distinguished only by an unsatisfactory antennal character.

The Canadian species of *Arthrochlamys* (except for *A. eubati*) appear to be monophagous. The habit is particularly noteworthy in *A. bebbianae* which sometimes forms rather populous colonies on *Salix bebbianae*. *A. alni*, a less gregarious species, is found generally, but usually rather sparingly, on *Alnus incana americana* Regel.

Eastern species of *Arthrochlamys* occur in the United States under various names. Their food plants include Alder, Willow, Sycamore, Hazel, *Quercus* spp., and *Betula alba*.

13.14 : 13.2 : 45.3 : 12.25. COMSTOCK, J. A., and HENNE, C. **Mature larva of *Graptolitha longior* Sm.** *Bull. Sth. California Acad. Sci.* 42 (3), 1944 (132). Biol. Abstr. 18 (12288).

Describes mature larva of this moth, taken on *Juniperus utahensis* in Tulare Co., California.

13.14 : 13.2 : 45.3 : 12.25–8. MCGUFFIN, W. C. **New descriptions of larvae of forest insects, VI, *Semiothisa*, *Paraphia*, *Protoboarmia* (*Lepidoptera*, *Geometridae*).** *Canad. Ent.* 75, 1943 (134–8). I.I.E.

The species described are *Semiothisa granitata* Gn., *Paraphia piniata* Pack., and *Protoboarmia porcelaria indicataria* Wlk. All occur on White, Black and Engelmann Spruce, Balsam Fir, Tamarack, Hemlock, and Jack Pine. In addition, *S. granitata* occurs on Red Spruce, Sitka Spruce, Western Larch, Western Hemlock, Douglas Fir, Alpine Fir, Amabilis Fir, and Red Pine; *Paraphia piniata* occurs on White Cedar, White, Lodgepole and Scots Pine, and White Birch; and *Protoboarmia porcelaria indicataria* occurs on Red Spruce, Western Larch, Douglas Fir, Alpine Fir, Western Hemlock, White Cedar, Western Cedar, White, Red, Lodgepole and Scots Pine, Poplar, Yellow Birch, and Bur Oak.

13.15 : 13.2 : 45.3 (74.6) : 12.25. CONNECTICUT. **Agricultural Experiment Station. Annual report for the year ending October 31, 1942.** *Bull. Conn. agric. Exp. Sta.* No. 468, 1943 (57–95). I.I.E.

Population studies of the European Pine shoot moth (*Rhyacionia buoliana*) in a Red Pine (*Pinus resinosa*) plantation at North Guilford, Connecticut, revealed that low winter temperatures had resulted in a mortality of 92 per cent. of the over-wintering larvae. The fact that populations of the larvae persist in the northern part of the State where the normal winter temperatures are much lower than in the shore region suggests the development there of a cold-hardy race.

13.15–9 : 13.2 (66.9) : 12.19 : 12.26–8. NASH, T. A. M. **The probable effect of the exclusion of fire upon the distribution of tsetse in Northern Nigeria.** *Farm and Forest* 5, 1944 (8–12).

In spite of East African reports of the success of woodland densification (through fire protection) as an anti-tsetse measure, experience in Northern Nigeria has shown that in this area such a policy tends to have the opposite effect. In East Africa, climatic conditions are such that open woodland provides the most favourable habitat for *Glossina* spp., whereas in Northern Nigeria the species are confined mainly to riverine thickets and residual islands of forest which shut out the sun and desiccating winds and help to conserve moisture after the rainy season. *G. morsitans*, the most drought-hardy of the three common tsetse-flies of Rhodesia, cannot survive at temperatures above 160° F., and its continuance in forest areas is dependent upon the presence of the cooler and more equable microclimates which are provided by a thick vegetation. *G. tachinoides* and *G. palpalis*, the other two common species, require even more humid conditions than *G. morsitans*, and would therefore also be favoured by any increase in the density of vegetation. The *Isoberlinia* woodland of Northern Nigeria is generally free from tsetse infestation except in the vicinity of riverine vegetation and thickets, and since in many plant communities the successional trend in fire-protected areas is towards

thicket formation, it is clear that exclusion of fires would favour the spread of *Glossina* spp.

It is recommended that all fuel plantations and forest reserves in the vicinity of towns should be situated at least a quarter of a mile from stream banks.

13.19 : 13.2 : 01.7. PREBBLE, M. L. **Sampling methods in population studies of the European Spruce sawfly, *Gilpinia hercyniae* (Hartig), in eastern Canada.** *Trans. roy. Soc. Can.* 37, Sec. 5, 1943 (93–126). L.S.

The author describes three methods which illustrate separate phases in the development of a sampling technique for estimating the population of cocoons of *Gilpinia hercyniae* in eastern Canada. The distributions obtained by the most satisfactory sampling method were investigated for two plots over a 3-year period.

13.19 : 13.2 (74.1) : 45.3 : 12.25. DIRKS, C. O. **Population studies of the European Spruce sawfly in Maine as affected by natural enemies.** *J. econ. Ent.* 37, 1944 (238–42). [Univ. of Maine, Orono.]

This paper presents results of work on *Gilpinia hercyniae* Htg. in Maine covering the five-year period from 1939 to 1943. The decrease in the abundance of the sawfly during this period is believed to be due partly to the destruction of cocoons by native mammalian and insect predators (including shrews, mice, squirrels, Elaterid larvae, and Carabid adults and larvae) but more particularly to parasitism by the introduced cocoon parasite, *Microplectron fuscipennis*. In 1940, 1941 and 1942 a wilt disease of the European Spruce sawfly larvae also caused a high percentage of mortality.

13.2. *Special [Systematic] Zoology*

13.2 (41.5) : 13.14–5 : 45.3 : 12.26–8. BEIRNE, B. P. **The biology and control of small Ermine moths (*Hyponomeuta* spp.) in Ireland.** *Econ. Proc. R. Dublin Soc.* 3 (15/16), 1943 (191–220). R.A.E. 32A (157–9).

The author describes characters distinguishing the larvae and adults of the three common species of *Hyponomeuta* (*padellus*, L., *cognatellus*, Hb., and *euonymellus*, L.), records their food plants and distribution in general and in Ireland, and gives an account of the bionomics of *H. padellus*, based on the literature and on observations of infestations on Apple and Hawthorn (*Crataegus oxyacantha*) in various parts of Ireland in recent years. He discusses the occurrence of biological races of this species.

The life histories of *H. cognatellus* and *H. euonymellus*, which feed, respectively, on *Euonymus* spp. and *Prunus padus*, are similar to that of *H. padellus*. A list is given of five other species of *Hyponomeuta* that occur in the British Isles, with their food plants.

Reasons for the sudden outbreaks of any of the three common species are discussed and control measures are indicated.

13.2 (728 : 729 : 73 : 8). BLACKMAN, M. W. **New species of American Scolytoid beetles, mostly neotropical.** *Proc. U.S. nat. Mus.* 94, 1943 (371–99). L.S.

Descriptions are given of one new genus and 29 new species of bark beetles representing a number of genera in several more or less distantly related tribes or subfamilies. The genus and 3 species are from the United States, 12 species are from Central America, 4 species from the West Indies, 3 species each from Colombia, Bolivia and Argentina, and one species from southern Brazil. The groups represented are Bothrosternini, Camptocerini, Hexacolini, Hylesinini, and Phloeotribini.

13.2 (82). MONRÓS, F. Algunos coleópteros de interés forestal observados en la Isla Victoria (Gobernación de Neuquen). **[Some Coleoptera of forest interest observed in the Isla Victoria (Department of Neuquen).]** *Repr.* [1944] from *Rev. Fac. Agron. Vet.* 10 (3), 1943. pp. 10. [Span.span.e.port.]

The author presents a list of xylophagus Coleoptera observed by him on Victoria Island of the National Park of Nahuel Huapi in Argentina.

2. SILVICULTURE

2 : 12.19.2 (213) : 07.2. FRANCKE, A. Über bisherige Waldbautätigkeit im tropischen Regenwald. **[On silvicultural activities in the tropical rain forest up to the present time.]** *Z. Weltforstwirt.* 10, 1943 (411–28). [G.e.f.]

Brief notes on past research, notably in the British, French, and Dutch empires, with a detailed bibliography giving the publications on which the notes are based.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.9. *Longevity*

21.9 : 12.25–8. RAIZADA, M. B. **The longevity of plants.** *Indian For.* 70, 1944 (207–10). [Forest Research Institute, Dehra Dun.]

A summary of data concerning the longevity of Phanerogams based on a book by Hans Molisch entitled 'Die Lebensdauer der Pflanze' (1928) and translated into English by E. H. Fulling in 1938. A list is given of the relative maximum ages of some common trees. *Macrozamia* sp. heads the list with a possible maximum age of 12,000–15,000 years, while *Adansonia digitata* and *Sequoia* spp. take second and third places with maximum ages of 5,150 and 4,000–5,000 years, respectively.

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.1. *High Forest Forms*

22.1 : 24.2 : 12.19.2 (77.3–6) : 12.25–8 : 60.31. STOTT, C. B., BARTON, W. W., and STONE, J. H. **Results of forest cutting practices in various Lake States timber types.** U.S. Forest Service, Region nine, Milwaukee, Wisconsin. 1942. pp. iii + 56.

For more than twenty years foresters have been carrying on practical experiments in the management of the Lake States forest types, and the effects of different cutting practices, ranging from clear cutting to individual tree selection, have been recorded by types and stands. The information that is now available is brought together in the present booklet, chiefly for the benefit of local foresters. Forest types dealt with and illustrated in numerous photographs are the Jack Pine, swamp Black Spruce, Aspen, Red Pine, White Pine, upland White Spruce/Balsam Fir, northern hardwood/Hemlock, northern Hemlock, and northern White Cedar.

22.12.1 (494). FAVRE, E. Cinquante années d'application de la Méthode du contrôle à la forêt de Couvet (Jura neuchâtelois). **[Fifty years of applying the Méthode du contrôle to the forest of Couvet.]** *J. for. suisse* 94, 1943 (88–94, 116–22, 138–49).

This article, dedicated to the memory of Henri Biolley, gives a description of the forest and its management together with data on stand structure and growth obtained in periodic measurements.

22.14.2 : 66. CHAPMAN, H. H. **Is selective cutting a panacea for forest regulation?** *J. For.* 42, 1944 (345–7).

The problem of public regulation of cutting on privately owned forest lands in the United States is confused through failure to distinguish clearly between (1) the direct economic objective of sustained yield and (2) the silvicultural objective of maintaining the productive capacity of forest land by means of minimum cutting requirements to secure reproduction and continuous growth. In the past, clear cutting has been associated with forest destruction and the complete absence of any silvicultural system; the tendency now is to avoid clear cutting wherever possible.

In an attempt to solve the dual problem of sustained local supplies of timber and renewal of the forest from seed, foresters have favoured a widespread adoption of a system of partial cutting, referred to generally as 'selective cutting', for application to all forest types irrespective of the silvicultural requirements of the species present. The author points out the dangers in such a development, and indicates the place for both partial cutting and clear cutting in sustained-yield management.

22.14.2 : 12.25 (71.1) : 21.7 : 23.1. BRITISH COLUMBIA. **Report of the Forest Branch for the year ended December 31st, 1943.** King's Printer, Victoria, B.C. 1944. pp.71 + plates.

An experiment in selective logging of Engelmann Spruce was made to determine the effect on windthrow and reproduction of the removal of different proportions of the stand, three degrees of cutting being used to remove (1) 13·6 per cent. of the number of Spruce and 34 per cent. of the volume of trees 12 in. d.b.h. and over; (2) 30 per cent. of the number of Spruce and 56 per cent. of the volume of trees 12 in. d.b.h. and over; (3) all Spruce over 12 in. d.b.h. Two years after logging, conditions with regard to windthrow, slash and drying out of the forest floor were more favourable on the selectively-cut than on the clear-cut areas (pp. BB 14–5).

22.6. *Changes of Silvicultural System*

22.6 : 12.25. ROTH, C. Über die Umwandlung reiner Fichtenbestände. **[On the transformation of pure Spruce stands into mixed stands.]** *Schweiz. Z. Forstw.* 94, 1943 (147–9). [G.]

The plantations of Spruce which to-day dominate the vegetation in the Swiss interior are quite foreign to the area and cause definite soil deterioration. In order to prevent further deterioration it will be necessary as far as possible to convert the pure Spruce stands to the mixed hardwood type that is native to the district. Not less than 50 per cent. hardwoods should be present in mixture with Spruce, while in the present mixed hardwood stands the proportion of exotic species should not exceed one in three.

22.8. *Silvicultural Description of Forms of Stand*

22.83 : 57.0 : 63. BAADER, G. Der Mischbestand. **[The mixed stand.]** *Allg. Forst- u. Jagdztg.* 119, 1943 (151–9). [G.]

A general theoretical discussion of the composition, structure, and rotation of mixed stands, and of the problems of research on the growth of mixed stands.

22.89 (77.1) : 12.25–8 : 23.24. PATON, R. R., SECREST, E., and EZRI, H. A. **A survey of forest plantations in Ohio.** *Bull. Ohio agric. Exp. Sta.* No. 647, 1944. pp. 77.

The data given in this bulletin on the condition and growth of some 2,500 plantations in Ohio were obtained in a special survey designed to collect information on suitable methods for afforesting non-productive land (abandoned agricultural land, etc.) in this State; it is estimated that there are 1½–2 million acres of such land scattered through the State.

22.89 (945) : 12.25 : 23.21 : 96.5. [GALBRAITH, A. V.] **History of Victorian softwood plantations.** *Aust. Timb. J.* 9, 1943 (422–3).

By 1939 the Victorian Forests Commission had established exotic conifer plantations covering over 50,000 acres. The chief species that have been used for planting on a commercial scale, in order of suitability, are *Pinus radiata*, *P. laricio*, and *P. ponderosa*. Post-war planting, which is to include afforestation, chiefly with conifers, and the re-establishement of native hardwoods, is to be carried out at a rate of 17,000–20,000 acres per annum for a period of 10 years.

23. FORMATION OF STANDS

23.1. *Natural Regeneration*

23.1 (54) : 12.25 : 12.26–8 : 24.1. PRASAD, J. **The role of experimental research in the natural regeneration of Indian tree species by seed.** *Indian For.* 70, 1944 (142–7). [Forest Research Institute, Dehra Dun.]

Suggestions are made on subjects and methods of research pertaining to the natural regeneration of some Indian tree species by seed, particularly as exemplified by *Abies webbiana*, *Cedrus deodara* and *Hopea parviflora*.

Results from an experiment carried out in Madras Province with *H. parviflora* showed that the removal of *Strobilanthes* and other undergrowth (including tree growth of 3-in. diameter and less, other than *Hopea* and *Mesua* saplings), and the girdling of trees (other than these two species) whose crowns were not in the upper canopy, had a markedly beneficial effect on the progress of regeneration towards establishment. This effect was visible from the second year onwards after the treatment.

23.1 (54.2 : 54.5–6) : 12.25 : 21. SEN GUPTA, J. N. **[The regeneration of Fir forests.]** Paper (I). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 23, 1941 (535–43).

23.1 (54.5) : 12.25 : 21. MOHAN, N. P. **[The regeneration of Fir forests.]** Paper (II). With note by D. N. Kaul and report of debate on *Item* 23. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 23, 1941 (543–5, 545–6, 546–7).

N. P. Mohan's paper, which is an up-to-date summary of a more comprehensive paper by P. N. Suri, Punjab Forest Conference, 1933, deals with investigations into the regeneration of forests of *Abies pindrow* in the Punjab Himalayas. These Silver Fir forests

e classified into ten treatment types based on asso-
ated broadleaved trees and characteristic species of
e understorey and ground cover (see Sen Gupta's
aper *infra* for details). Abundant natural regenera-
on of Silver Fir exists where mineral soil has been
posed, shrub and weed growth are scanty, or the
ndergrowth consists of scattered bushes, or there is an
en underwood of broadleaved trees, or where the
nopy is naturally broken or moderately opened out.
atural regeneration is absent where there is a thick
cumulation of humus, felling refuse, or weeds and
rubs, or where the canopy is very open, grazing is
avy and drainage is bad. It is recognized that an
termediate stage of broadleaved trees between a
ature Fir forest and young Fir regeneration is essential.
emoval of the thick undecomposed humus is the key
the solution and may be effected by burning or
raping or introducing hardwoods. For the last
ethod a number of exotic and indigenous quick-
owing species are under trial.

J. N. Sen Gupta's paper summarizes the literature on
ie subject (10 references) and reviews the foregoing
formation more fully, including data from Kashmir
nd the United Provinces.

The debate was opened by Harman Singh with a
omprehensive survey of the silvicultural and economic
spects of Fir forests in Kashmir. Agreeing that most
f the factors inimical to Fir regeneration were known
nd that their removal was expensive, he showed that
ie forests would not remain uneconomic for ever and
dvocated co-operative research by provinces interested.

3.1 : 12.25 (54.2). MOBBS, E. C. **[The regeneration of Deodar forests.]** Paper (I). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 22, 1941 (519–21).

3.1 : 12.25. RAYNOR, E. W. **[The regeneration of Deodar forests.]** Paper (II). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 22, 1941 (521–2).

3.1 : 12.25 (54.5). MOHAN, N. P. **[The regeneration of Deodar forests.]** Paper (III). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 22, 1941 (522–4).

3.1 : 12.25 (54.6). KAUL, D. N. **[The regeneration of Deodar forests.]** Paper (IV). With report of debate on *Item* 22. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 22, 1941 (524–7, 527–33).

The series of papers and the subsequent debate pro-
ide an informative resumé of experience in the
egeneration of *Cedrus deodara* in the wet and dry zones
f the northwest Himalayas. E. C. Mobbs, writing of
he Chakarata forest, United Provinces, states that
atural regeneration appears most readily after retro-
ression caused by fairly heavy grazing and cutting of
nderwood with only slight removal of the overwood,
nd that the absence of regeneration in protected moist
reas is due to increase of weeds and shrubs. E. W.
Raynor, on the other hand, finds that the crux of the
hole matter is in the intensity of seeding fellings and
lash burning with supplementary sowings where
eeded. D. N. Kaul describes the obstacles to Deodar
egeneration in Kashmir, where climatic conditions are
ery favourable, but grazing, infrequent seeds years,
ires, drought and invasion by *Parrotia jacquemontiana*
ave demanded a special technique. H. S. Pathania
onsiders one of the causes of regeneration failures in
Kashmir to be the excessive initial opening of the
anopy. N. P. Mohan's paper deals with wet-zone
ypes of Deodar forest in the Punjab, of which 6 are
ecognized, and discusses manipulation of the canopy, debris burning, grazing, sowing and planting. K. L. Aggarwal deals with problems in the dry zone of the Punjab and contributes a critical summary of the 4 papers presented. P. D. Raturi observes that in Tehri Garwahl Deodar regenerates easily where the canopy is judiciously opened and grazing is excluded.

After discussion, which dealt also with fires and Deodar indicators, the Conference concluded that Deodar has been regenerated successfully under so wide a range of conditions that there should ordinarily be no difficulty with it, provided appropriate methods are used; that a suitable admixture of hardwoods reduces fire hazards; and that controlled grazing is valuable in reducing excess humus, weeds and fire hazard.

23.1 : 22.89 (77.1) : 12.26–8. PATON, R. R. **Volunteers in Ohio forest plantations.** *J. For.* 42, 1944 (420–2). [Ohio Division of Forestry, Wooster, Ohio.]

A survey of 2,507 plantations in Ohio showed that 76 per cent. of them had natural reproduction (volunteers), the average density being 541 volunteers per acre. The species and number of volunteers varied considerably by forest regions, the species showing the greatest abundance for the State as a whole being Elm, Cherry, Hawthorn, White Ash, and Sugar Maple. Availability of seed is one of the principal factors determining the establishment of volunteers; birds and wind are important as distributing agents.

23.2. *Artificial Regeneration*

23.2 : 12.19.2 (54.8) : 12.26–8. LAURIE, M. V. **[Artificial regeneration in dry forest types.]** Paper (I). **Artificial regeneration in dry forests in Madras.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 18, 1941 (419–28).

23.2 : 12.19.2 (54.5) : 12.26–8. PARKER, R. N. **[Artificial regeneration in dry forest types.]** Paper (II). **Artificial regeneration in dry forests in the Punjab.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 18, 1941 (428–9).

23.2 : 12.19.2 (54.8) : 12.26–8. MUTHANNA, M. A. **[Artificial regeneration in dry forest types.]** Paper (III). **Short note on artificial regeneration in dry areas in the Kadur Forest Division, Sakrepatna Tract.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 18, 1941 (429–32).

23.2 : 12.19.2 (54.8). VENKATA RAO, K. R. **[Artificial regeneration in dry forest types.]** Paper (IV). **Artificial regeneration in dry areas [in Mysore].** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 18, 1941 (432–3).

23.2 : 12.19.2 (54.8). MURTHI, S. **[Artificial regeneration in dry forest types.]** Paper (V). **A short note on the methods of regeneration employed in afforesting some of the dry bare hills in the Chitaldrug District.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 18, 1941 (433–6).

23.2 : 12.19.2 (54.2). RAYNOR, E. W. **[Artificial regeneration in dry forest types.]** Paper (VI). **Artificial regeneration in dry forest types.** With summary of debate on *Item* 18. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 18, 1941 (436–9, 439–43).

Artificial regeneration in the dry scrub forests of Madras is dealt with in M. V. Laurie's paper [cf. *Indian For. Rec.* (*n.s.*) *Silviculture* 3 (8), 1939] and in debate by A. L. Griffith. These fuel forests are generally worked as coppice on a rotation of 30–40 years; mortality of stools is 5–10 per cent. at each felling and natural regeneration is practically absent. Restocking is attempted as fully as possible by the *taungya* (or *kumri*)

system (i.e. tree seeds sown in conjunction with the cultivation of field crops by villagers) and the remaining area is done by the *rab* method (i.e. sown in patches or strips on which brushwood and weeds have been burnt, and the soil is worked and protected against erosion). M. A. Muthanna describes the artificial regeneration of dry areas in Sakrepatna forest, Mysore. Similar work in Mysore is the subject of papers by K. R. Venkata Rao (Kolan) and S. Murthi (Chitaldrug) with particular reference to the trench and mound method so successfully introduced. Further details on *rab* and *taungya* in Mysore are given by C. A. Jabbar. In debate K. P. Sagreiya fully describes the agri-silvicultural operations in Berar where rich black cotton soil is cultivated for long periods and forest trees are introduced in the 3rd or 4th year, with the object of converting open scrub forest into well-stocked stands of 50–100 per cent. Teak. E. W. Raynor's paper describes attempts to afforest dry sandy bhur areas in the United Provinces, and R. N. Parker deals with afforestation of the Pabbi Hills and the dry zone in Upper Bashahr, Punjab. In these papers details of operations, species used, and, in most cases, costs are given.

23.21. Choice of Species

23.21 : 12.26–8 (494). LUZE, J.-J. DE Le châtaignier, essence à propager. **[The Chestnut, a species to propagate.]** *J. for. suisse* 94, 1943 (222–6). [F.]

A plea to propagate *Castanea sativa* in Switzerland on a larger scale than has been done hitherto. Most of the existing trees are in the Tessin Canton.

23.21 (54) : 21. PARKER, R. N. **[The introduction of exotics.]** Paper (I). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 21, 1941 (499–503).

23.21 (54.3). SAGREIYA, K. P. **[The introduction of exotics.]** Paper (II). **Introduction of exotics in the Central Provinces forests.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 21, 1941 (503–5).

23.21 (54.8) : 12.25–8. GRIFFITH, A. L. **[The introduction of exotics.]** Paper (III). **Notes on exotics introduced into the Madras Presidency, since the last Silvicultural Conference (1934).** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 21, 1941 (505–10).

23.21 (54) : 07.2. LAURIE, M. V. **[The introduction of exotics].** Paper (IV). **Summary of points in other notes received with a note on the organization of research into exotics.** With summary of debate on *Item* 21. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 21, 1941 (510–2, 513–8).

The paper by R. N. Parker refers to the difficulty of defining the term 'exotic', describes the common mistakes made when trying to introduce exotics, and enumerates the main factors to be considered before an introduction, concluding that experiments are justified if (*a*) the exotic species has some quality which gives it an apparent advantage over indigenous plants, (*b*) it comes from a climate very similar to that of the locality in which it is to be tried, (*c*) its requirements are known. In general, a plant which has a wide distribution in its native land, is hardy, and will regenerate naturally, is likely to be more adaptable to cultivation in another country than one which has a very limited distribution. K. P. Sagreiya records the results with exotics tried in the Central Provinces. A. L. Griffith gives similar information for Madras and details the seed weight, germinative capacity and plant percentage for each species. M. V. Laurie summarizes what is known of exotics in Bombay, Kashmir, Travancore, Bihar, United Provinces and Mysore and provides a note on the organization of research into exotics.

In the debate other speakers discussed the importance of the microclimate of the young tree, conditions under which exotic fodder grasses can be grown, the definition of 'exotic' and the economic prospects of experimental introductions.

23.21 (54.87) : 12.26–8 : 21.3 : 23.24.3. CEYLON. **Silvicultural research administration 1942.** [Ceylon Forest Department.] 1943. pp. 8.

In afforestation trials in Upcountry dry patana grassland areas it has been found that, except on the poorer upland soils, the timber Eucalypts (*Eucalyptus citriodora* and *E. maculata*) are better developed when grown in mixture of 50 per cent. *Callitris*, particularly *C. calcarata*, and 25 per cent. *Eucalyptus robusta*. *E. saligna* is found to be definitely unsuited for general planting on these areas, giving very poor results on exposed sites or degraded soils. Tests with *E. alba* have given relatively poor results (p. 3).

Experimental plots in the wet patana grassland areas indicate that, of the species tested, Red Gum (*Eucalyptus robusta*) is best adapted to these soils where it should be planted at a relatively wide espacement, e.g. 12 × 12 ft. (p. 4).

23.21 (74.7) : 12.25 : 22.89. LITTLEFIELD, E. W. **A plantation of Ponderosa Pine in northern New York.** *J. For.* 42, 1944 (364–5). [New York State Conservation Department, Albany, N.Y.]

Results from test plantations of *Pinus ponderosa* established in various parts of New York State in the years 1909 and 1911 indicate that although the extensive use of this species may not be justified it has possibilities in certain localities and on some sites. A small 32-year-old plantation showed a height of 30–40 ft. and diameter of 4–10 in., the crowns of the dominants being well developed; the trees showed little damage from *Cronartium comptoniae* although infection was present on sweet fern and other species of Pine in the neighbourhood. More recent plantings of *Pinus ponderosa* are growing well and show some indication of resistance to attack by the European Pine shoot moth (*Rhyacionia buoliana*).

23.21 (77.1) : 12.25 : 12.11.3. PATON, R. R. **Dunkeld Larch in Ohio.** *J. For.* 42, 1944 (452–3). [Ohio Division of Forestry.]

Comparable survival and growth data are given for Dunkeld, Japanese and European Larch planted on similar sites in an arboretum in Ohio. Thus far the Dunkeld Larch (× *Larix eurolepis*) has not shown any marked superiority to either of its parents in growth or form.

23.22. Preparatory Work. Auxiliary Measures

23.22.1 : 23.23 : 12.25. LEIBUNDGUT, H. **Contribution à l'étude de la question du rajeunissement du mélèze. [Contribution to the study of the question of Larch regeneration.]** *J. for. suisse* 94, 1943 (233–5). [F.]

From an experiment in the Valais Canton it appears that the removal of grass and acid humus influences very favourably the regeneration of Larch by direct sowing, the number of 1-year plants obtained being very much larger following this treatment than on untouched control plots.

23.23. Sowings

23.23.1. *Seed Procurement, Treatment, and Testing*

23.11 : 12.25–8 (494). OBERLI, H. Das Waldsamenjahr 1942. [The forest seed year 1942.] *Schweiz. Z. Forstw.* 95, 1944 (25–30). [G.]

The year 1942 was an unusually good seed year for Spruce and Beech in Switzerland, as illustrated by data collected by the writer.

23.12 : 07.7. MESSER, H. Forstliche Steiggeräte. [Tree climbing equipment.] *Forstarchiv* 19, 1943 (146–7). [G.]

Several German models of climbing irons and other tree-climbing tools are described and their advantages and disadvantages discussed.

23.15 : 12.26–8. WILSON, J. K. **Immersing seeds of species of *Robinia* in boiling water hastens germination.** *For.* 42, 1944 (453–4). [New York State College of Agriculture.]

Tests have shown that immersion of seeds of *Robinia hispina* and *R. riscosa* in boiling water for one minute will greatly increase the germination percentage.

23.19. **Testing dormant seeds.** *Amer. Nurserym.* 79 (5), 1944 (23).

By removing the embryos from dormant seeds and placing them under favourable conditions for growth, it is possible to obtain a direct reading of their viability within 5 to 20 days. This method is particularly useful in the case of seeds which normally have a long period of dormancy before germination.

23.19 : 12.25. TIRÉN, L. Tallfröets grobarhet i Norrland. Preliminärt meddelande. [Germination capacity of Pine seed in Norrland. Preliminary communication.] *Skogen* 31, 1944 (16). [Sw.]

As part of research planned to discover a rapid method for a preliminary determination of germination capacity before collecting cones, the Swedish Forestry Research Institute (Skogsförsöksanstalt) conducted an inquiry on Pine cone samples taken from different altitudes in Norrbotten, Västerbotten, Jämtland and Kopparberg. The data obtained on the germination of Pine seed are also of value in arriving at the possibilities of cone collection in winter and are therefore provisionally recorded here.

A tabular summary for the various districts, altitudes and latitudes is given, showing the 1,000 seedweight and percentage germination after 10 days. This percentage was on the whole satisfactory though characterized by marked local variations.

Certain latitudes and altitudes are specified as quite suitable for Pine cone collection in autumn to augment supplies of seed for Sweden. Storage under proper conditions is necessary. M. L. C. W.

23.23.3. *Methods of Sowing*

23.23.3 : 12.25. BRITISH COLUMBIA. **Report of the Forest Branch for the year ended December 31st, 1943.** King's Printer, Victoria, B.C. 1944. pp. 71 + plates.

An experiment in the direct seeding [of Douglas Fir?] was examined ten years after establishment. A 6 × 5 ft. spacing of seed spots gave complete coverage of the ground. The effects of more than one seedling growing on a single spot are listed as follows:—(*a*) Suppression of the young seedlings by weeds was reduced. (*b*) The benefits of the increased density were obtained early in the life of the stand. (*c*) The heights of dominant seedlings were greater as the number of seedlings per acre increased, at least up to nine trees per spot. (*d*) The dominant trees on sq.-ft. spots carrying twelve seedlings had thinner lateral branches than single trees and the trunks were straight and symmetrical.

Screening of spots gave protection against mice, increased survival and improved the form of the trees (p. 14).

23.24. Formation of Stands by Planting

23.24 : 24 : 12.26–8 (54). LAURIE, M. V. [Teak plantation technique.] With summary of debate. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 15, 1941 (375–8, 378–81).

Attention is drawn to the considerable variation in the methods of making Teak plantations in different parts of India. This seems to be due to lack of knowledge and appreciation of recent advances in Teak plantation technique, coupled with reluctance to introduce new and more efficient methods when an old one is well established; at the same time further experimentation is needed to determine for every locality individually the details of the best technique to adopt. Further investigation is needed in the selection of sites, method of stocking, stump planting, nursery work, weeding, *taungya*, spacing and early thinning, and timber quality.

The ensuing debate, which dealt primarily with stump planting, reached the resolution that available information on the artificial regeneration and subsequent tending of Teak should be collected and published and further research should be regulated in close co-operation with provincial silviculturists and territorial staff. This resolution has since been put into effect by the publication of 'Teak plantation technique' as *Indian For. Rec.* (*n.s.*) *Silviculture* 5, 1942 (123–219 [cf. *For. Abstr.* 5 (177)].

23.24 (54) : 22.83 : 23.21. LAURIE, M. V. [Mixtures in plantations.] Paper (I). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 14, 1941 (349–62).

23.24 (59.1) : 22.83 : 12.26–8. KERMODE, C. W. D. [Mixtures in plantations.] Paper (II). With notes from the Provinces and summary of debate. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 14, 1941 (362–7, 367–72, 372–4).

Sporadic attempts have been made at raising mixtures in plantations in India and Burma but no systematic research has been organized. M. V. Laurie's paper proposes a classification of mixtures according to the main purpose they are intended to achieve, e.g. permanent mixtures to maintain or improve soil and site qualities, to reduce insect attacks and disease, to improve timber form, or to obtain an increased value return; and temporary mixtures to determine the most suitable species, to protect against frost, insolation, browsing, etc., to provide crown competition for good growth form, or to provide additional revenue. Examples of these classes are given and a brief critical summary is appended of experimental mixtures tried in plantations in various parts of India. C. W. D. Kermode presents an account of experimental mixtures raised in Burma, chiefly Teak and *Xylia dolabriformis*.

Short notes on experimental mixtures in Assam, Bengal, Bombay, Central Provinces, Madras, Punjab and United Provinces are also recorded, together

comprising a great variety of species and local conditions.

23.24 (949) : 12.25 : 23.27 : 23.21 : 98.1. TERRELL, A. K. À B. **Forestry operations and ornamental planting in the Australian Capital Territory.** *Quart. J. For.* 38, 1944 (5–10).

A note on the management and utilization of the conifer plantations in this Territory and on ornamental tree planting in Canberra. The species used in forest plantations are mainly *Pinus radiata* (11,000 acres) and *P. ponderosa* (2,000 acres).

23.24.2. *Methods of Planting*

23.24.2 : 12.26–8 (54.8). [GRIFFITH, A. L.] **[Sandalwood problems—Sandalwood plantation technique.]** Paper (I). *Proc. 5th silvic. Conf., Dehra Dun, 1939, Item* 20 (*a*), 1941 (461–8).

23.24.2 : 12.26–8 (54.8) : 24. LAURIE, M. V. **[Sandalwood problems—Sandalwood plantation technique.]** Paper (II). **Sandalwood plantation technique in Coorg.** *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 20(a), 1941 (468–72).

23.24.2 : 12.26–8 (54.8). VANKATA RAO, M. G. **[Sandalwood problems—Sandalwood plantation technique.]** Paper (III). With summary of debate on *Item* 20(a). *Proc. 5th silvic. Conf., Dehra Dun, 1939, Item* 20(a), 1941 (472–4, 475–7).

These papers record up-to-date detailed information on the technique of plantations of *Santalum album*. A note by K. Krishnaswamy supplements the third paper. These contributions illustrate the great variety in the conditions of Sandalwood plantations and the divergence in the types of work in progress in the Provinces and States of India.

23.26. Plant Rearing. Nursery Practice

23.26.1 : 12.11.12. OLSON, R. V. **The use of hydroponics in the practice of forestry.** *J. For.* 42, 1944 (264–8). [Hercules Powder Company.]

Seedlings of both coniferous and deciduous species were grown from seed in nutrient solution in early spring and later transplanted to nursery beds for further development and hardening. Analysis of seedlings showed higher dry weights, a relatively high content of nitrogen, phosphorus, and potassium, and a better balanced ratio of these elements than in seedlings raised in fertilized nursery soil. Growth and survival of transplants was satisfactory and it is suggested that the use of nutrient-solution technique will accelerate the production of mature planting stock and improve its quality. One of the important advantages of the method is the possibility of controlling closely the morphological development of seedlings through adjustment of the nutrient ratio.

23.26.4 : 12.25 : 11.47.13. CONNECTICUT. **Agricultural Experiment Station. Annual report for the year ending October 31, 1942.** *Bull. Conn. agric. Exp. Sta.* No. 468, 1943 (57–95). I.I.E.

Norway and White Spruce stock which had been fertilized in the nursery with 12–4–4, 4–12–4, or 4–4–12, but had not been fertilized in the field, showed no improvement in survival or growth over untreated trees. Neither vitamin B_1 nor starter solution, had any significant effect upon survival or growth.

23.27. Arboriculture

23.27 : 12.25–8. MALMBORG, G. E. **Unusual ornamental trees and shrubs.** *Amer. Nurserym.* 80 (1), 1944 (15, 30–4).

Among the trees listed by the author as suitable for ornamental purposes are species, varieties or forms of *Abies, Cedrus, Picea, Pinus, Tsuga, Ilex, Cercidiphyllum, Cercis* and *Fagus*.

23.27 : 23.21 : 23.24 : 24.4 : 4. LUNCZ, G. Les plantations routières et leur importance au point de vue forestier. **[Roadside plantings and their importance from the point of view of forestry.]** *Silvae Orbis* No. 5, 1942. pp. vii + 267. [F.] [Univ. royale 'Palatin Joseph', Budapest.]

A monograph based on replies from 44 countries (including colonies) to an enquiry that was begun by the International Institute of Agriculture in 1936, and on recent publications on the subject. It deals with the value of roadside trees in general; the relevant legislative and administrative measures of the various countries; technical information on suitable species, plantation work, and the maintenance and protection of the trees; and the importance of roadside trees from a forestry point of view (for timber production, as windbreaks, as suppliers of seed for forestry purposes, etc.). The monograph contains a fairly extensive bibliography and a list of species used as roadside trees in the different countries.

23.3. *Afforestation*

23.3 (45 : 496) : 12.25–8 : 11.2–4 : 21. KAYACIK, H. Grundlagen der Aufforstung im Mittelmeergebiet unter besonderer Berücksichtigung von Italien und der Türkei. **[Principles of afforestation in the Mediterranean area with particular reference to Italy and Turkey.]** M. Dittert and Co., Dresden A16, Pfotenhauerstrasse 28/30. 1941. pp. vi + 134 + plates. [G.]

The booklet deals with the geology, soils, and climate of the Mediterranean countries generally; the site requirements of Mediterranean tree species; the afforestation techniques used in Mediterranean countries; and general prospects of afforestation in Turkey. Brief notes are given on the site requirements and treatment of the species of the coastal forests of the Mediterranean (*Pinus halepensis, P. brutia, P. maritima, P. pinea, P. insignis, Casuarina* spp., *Eucalyptus* spp., *Ailanthus glandulosa*, and Australian *Acacia* spp.), of the maquis (*Quercus ilex, Q. suber, Q. pubescens, Q. coccifera*, and *Olea europaea*), and of the forests found at the lower elevations of Mediterranean mountains (*Cupressus sempervirens, Quercus cerris, Fraxinus ornus* and *Pinus nigra*).

23.3 (489) : 96.5 : 11.62.11. GRØN, A. H. Le reboisement des landes dans le Jutland. **[Heath afforestation in Jutland.]** *Intersylva* 2, 1942 (11–22). [F.g.e.span. ital.]

In the past hundred years the forest area of Denmark has been doubled, owing largely to the afforestation of the heath lands of Jutland. The work was begun about 1790 and made considerable headway following the foundation, in 1866, of the Danish Heath Society (Danske Hedeselskab). Since 1885 considerable subsidies towards private afforestation work have been advanced by the State, which also carried on afforestation of its own. So far, some 123,000 ha. of heath land and 30,000 ha. of dunes have been covered with forests.

e heath-land plantations need hardly be enlarged bstantially beyond their present area. From a hnical point of view, the results of the afforestation rk have been generally satisfactory, except on the brest soils which carry Mountain Pine yielding a all amount of firewood. From the point of view of vate economy, the plantations have generally proved oor investment. However, such investments have ually been made by wealthy people, the money thus ng used for the production of capital goods inside country instead of being spent on luxury articles ported from abroad. 'None of the entrepreneurs s increased his fortune by afforesting the heath lands, d some have even incurred considerable losses; but nmark has become wealthier.'

.3 (77.5) : 96.5. **Reforesting plan outlined for Wisnsin.** *Paper Tr. J.* 118 (11), 1944 (12). P.R.

According to the programme of the paper industry the Wisconsin River valley, organized under 'Trees Tomorrow, Inc.', it is proposed to reforest 5 million es of cut-over land in northern Wisconsin over a riod of 25 years. The aim is to build up a self-staining reservoir of material for the Wisconsin woodng industries.

23.6. *Care of Regeneration in the Initial Stage of Establishment*

.6 (79.4) : 42.22. WEIDMAN, R. H., and BERRIMAN, R. **Watering plantation trees.** *J. For.* 42, 1944 35–7). [Institute of Forest Genetics, Placerville, alif.]

Forest plantings on farm lands in the foothills of the erra Nevada, California, where summer rainfall is ctically nil, show a maximum survival of 20 per cent. thout artificial watering. A survival of 85 per cent. as obtained on one area where trees were planted der favourable conditions and watered twice during e first summer. While watering or irrigation of tensive forest plantations is not feasible, it is suggested at the watering of tree plantings for farm forestry, indbreaks, erosion control and arboreta in this gion would be possible and profitable.

24. TENDING OF STANDS AND TREES

24.2. *Thinnings*

4.21 : 12.25 : 23.6. JAMWAL, H. S. **Thinning in eodar regeneration.** *Indian For.* 70, 1944 (114–5).

The author quotes approximate optimum espacements for young Deodar trees of various heights up to ft. which will enable subordinate forest staff to thin ut thickets of young seedlings and so release them from vercrowding without fear of committing serious mis-kes.

4.25 : 12.25 (78.3). STUART, E., and ROESER, J. **ffect of thinning in the Black Hills.** *J. For.* 42, 1944 79–80). [Harney National Forest.]

At the end of 6- and 7-year periods following heavy inning of over-stocked sapling and pole stands of onderosa Pine, measurements were made of the owth of comparable trees in thinned and unthinned ands. Growth per cent. showed a marked increase the thinned as compared with the unthinned stands, nd basal-area increase during the 7-year post-thinning eriod represented an average increase of ·0302 sq. ft. per tree in the thinned area compared with an increase of ·0098 sq. ft. per tree in unthinned areas. Certain recommendations are made as to methods of cutting similar stands in the future.

24.25 : 56.04–05 : 12.25 : 23.23–4. VANSELOW, K. Ergebnisse der Bayerischen Durchforstungsversuche. 1. Die Fichtenbestände. [**Results of the Bavarian thinning experiments: 1. The Spruce stands.**] *Forstwiss. Cbl., Thar. forstl. Jb.* (*Kriegsgemeinschaftsausgabe*) No. 4, 1943 (105–36). [G.] [Forstliche Forschungsanstalt München.]

Since 1870 the Forest Research Institute of Munich has established a number of sample plots in order to investigate the effect of low thinnings of different intensities on the volume and value yield of Spruce stands. Some of the plots were also intended to furnish comparable information on the development of stands established by direct sowing and planting, respectively. Practically all the stands investigated are of first quality. At the last measurement their ages ranged from 64 to 104 years. The thinnings are of three kinds: light thinnings in which only suppressed, dead, or dying trees are removed (grade A); moderate thinnings in which, in addition, most of the dominated trees and part of the co-dominants are removed (grade B); heavy thinnings, in which suppressed and dominated trees and most co-dominants and a few dominants are removed (grade C). So far, between 6 and 13 thinnings have been carried out in the different sample plots over periods of 27 to 70 years. It would appear that the intensity of thinning had little or no influence on the average height of the remaining stand, the total volume of wood produced by the stand throughout its life, and, so far as relevant data are available, the stem form of trees felled to date. Compared with A-grade thinnings, B- and C-grade thinnings increased, on the average, the mean diameter of the trees in the remaining stand by about 9 and 23 per cent., respectively, raised substantially the total value production of the stands, and, in addition, yielded a larger proportion of the total revenue at comparatively early ages. In comparing stands established by direct sowing and plantations, it was found that the former are not inferior to the latter provided the thick growth resulting from successful sowing is properly thinned out at an early stage so as to prevent overcrowding.

24.25 : 12.25–8. RECKNAGEL, A. B. **Remeasurement of permanent sample plots on Arnot Forest.** *J. For.* 42, 1944 (293–4). [Cornell Univ.]

Eight series of permanent sample plots were established in 1927–28 in typical second-growth hardwood and Hemlock stands of the northern Allegheny Plateau. One plot of each series was left uncut as control and the one or two other plots were thinned in the spring of 1928 or 1929. Remeasurement of undamaged plots in 1943 showed growth in general to be poor on uncut control plots, fair to good on lightly cut plots, and good on more heavily cut plots. In stands bearing an understorey of Hemlock under hardwoods, the Hemlock remained suppressed on the uncut plot, a basal area of 1·501 sq. ft. being recorded for this species in 1943, whereas on a comparable area from which overtopping hardwoods had been removed, the Hemlock had become aggressively dominant and showed a basal area of 34·186 sq. ft. in 1943.

24.3. *Opening of the Canopy. Release and Improvement Fellings*

24.31 : 12.26–8. CEYLON. **Silvicultural research administration 1942.** [Ceylon Forest Department.] 1943. pp. 8.

Unwanted *Ficus* trees have been killed by introducing sodium arsenite into 16 ½-in. auger holes in each tree. It was found that the conducting tissues of the root and buttress systems of the tree are extremely complex and that to be effective the poison must be applied at carefully selected points (p. 6).

24.4. *Shelterbelts. Windbreaks*

24.4 : 65.7 : 11.12. NÄGELI, W. Untersuchungen über die Windverhältnisse im Bereich von Windschutzstreifen. **[Investigations on wind conditions in the vicinity of windbreaks.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 23, 1943 (223–76). [G.g.f.] E.F.A.

Report on recent investigations in Switzerland, especially on two shelterbelts in the Rhone valley, one 75 m. broad and very compact, consisting of a mixture of species, and the other 40–60 m. broad and less dense, consisting of Spruce. On the windward side the protective effect was noticeable up to a distance equal to 5–7 times the height of the belts, and on the lee side up to a distance equal to 25–30 times their height. The average wind velocity on the lee side within 200 m. or so of the belt was about one-third and one-half of that in the open in the case of the compact and the less dense belt, respectively.

24.4 (56.9) : 97.2. GUR, A. **Wood and windbreaks in the farm.** *Hassadeh* 23, 1943 (136–7). [Heb.] L.S.

24.5. *Pruning*

24.51 : 31.2. UNGER, R. G. **Pruning forest plantations.** New York State College of Forestry, Syracuse, N.Y. [1941?] pp. 10.

Pruning forest trees of their dead limbs at an early age limits the knotty core to an area 4 to 6 in. in diameter in the centre of the log, improves the appearance and workability of the timber, and increases its mechanical strength. As the cost of pruning is relatively high only those trees should be pruned which show promise of making up the final crop. Advice is given on pruning methods and equipment.

24.51 : 12.25. EDLIN, H. L. **Brashing conifers.** *Quart. J. For.* 38, 1944 (16–9).

The practice of 'brashing' or 'brushing-up' conifer plantations, which is of importance in British forestry, consists of the removal, 10–20 years after planting, of all dead branches up to a height of 6–7 ft. The advantages of this pruning operation are stated to be as follows: (1) the stand is made readily accessible; (2) trees felled immediately following brashing are utilized in the round and would have to be cleaned of the branches in any case; (3) crown fires are less likely to occur in brushed plantations; (4) the fallen brash has an effect upon the soil similar to the gardener's mulch of straw; (5) brashed plantations are less likely to become the haunt of undesirable animals (rabbits, deer, foxes, badgers, etc.); (6) brashing increases the value of the final timber crop.

24.51 : 12.25 : 44.3 : 12.21. BUCHANAN, T. S. **Effects of pruning young Western White Pine.** *J. For.* 42, 1944 (365–6). [U.S. Bureau of Plant Industry and Agricultural Engineering, Portland, Ore.]

Pruning experiments were made on young, thrifty Western White Pines (*Pinus monticola*) in an attempt to determine the amount of foliage a tree can lose from blister rust (*Cronartium ribicola*) attack before it is killed or seriously injured. From 25 to 80 per cent. of foliage of individual trees was pruned, in one case all living foliage being removed except that on the two or three youngest whorls. After two years all treated trees had survived and appeared healthy. The pruning had no significant effect on height growth while the effect on diameter growth was highly significant and more pronounced at 1 ft. from the ground than at b.h. or higher. Results from this study indicate that multiple twig and branch infections from the blister rust will have no direct effect in causing the death of Western White Pine.

24.51 : 24.21 : 33.15 (410). **Pruning in the light of post-war production.** *Quart. J. For.* 38, 1944 (19–21).

A note on the importance of pruning and careful thinning for the production of clear veneer logs under British conditions.

24.51 (54) : 21.62 : 23.24.3. LAURIE, M. V. **[Pruning in young crops.]** With notes by K. Bagchee and Ram Nath Sharma and report of debate. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 25, 1941 (561–8, 568, 569).

The author advocates investigations to determine what species in India require pruning or would benefit from it. Preliminary indications are obtainable from a study of the knottiness of timber in depots and from merchants. Research is then required into the rate of natural cleaning, with comparative investigations of pruning versus natural cleaning, involving the study of the rate of healing of wounds, susceptibility to damage by fungi, tendency to form epicormic shoots after pruning, etc. The economic height to which to prune, desirability of pruning forks, best age to start pruning, best season for pruning, selection of trees, etc. have to be investigated, and the cost of the operations, together with their effect on timber values, have to be determined. The possible advantages of wider initial espacements and heavier thinnings (timber cleanness being maintained by pruning) are worth investigating, and the best types of tools and methods of work need studying. Brief notes on the above points from European experience are given as well as on the effect of pruning on increment and bole form and on the necessity for proper records.

A note by K. Bagchee on the mycological aspects of pruning recommends the practice as likely to reduce the incidence or risk of heart rot.

The Conference agreed that systematic research into the value of pruning should be undertaken, particularly in view of the present tendency to heavier thinning.

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

. KOLLMANN, F. Stand der Wissenschaft vom Holz. **he position of knowledge on wood.**] *Z. Ver. dtsch. Ing.* „ 1943 (737–52). [G.g.] L.S.

A general review of biological, chemical, physical, d engineering research on wood in recent decades, sed on numerous literature sources.

31.0. *General Information on Woods*

„0 (410) : 12.25–8 : 21 : 24. BOULTON, E. H. B., and Y, B. A. **British timbers, their properties, uses and entification. With notes on the growth and cultivation the trees.** Adam and Charles Black, 4, 5, and 6, ho Square, London, W.1. 1944. pp. 112 + plates. The intention of the authors of this book, as expressed the preface, is to give an outline of some of the more portant aspects of British trees and timbers, without tempting to cover the general subjects of forestry, mber structure and properties of wood. Their object is ofold: (*a*) to enable landowners to know 'the most itable trees producing the most useful timber that will rive on their own land' and (*b*) to assist members the timber trade to appreciate the relation between e quality of the timber and the growth of the tree.

The main part of the book consists of a series of scriptions of the species grown in this country, ranged in four groups, the principal hardwoods, hard-oods of minor importance, the principal softwoods, d softwoods of minor importance. Each description cludes both the characteristics and requirements of e growing tree and the properties and uses of the mber. The sections dealing with the timber include neral appearance and properties, durability, season-g, workability, sizes and availability, and uses, and ovide a useful summary of the information to be und in the various publications of the Forest Products esearch Laboratory at Princes Risborough as well the authors' own observations. This should cer-inly help the landowner to learn more about the otentialities of his trees as timber.

The sections on the tree, as opposed to the timber, are ss satisfactory. The section headings themselves—istribution, The Tree, Soil and Situation, Sylvicultural haracteristics, Cultivation, Diseases, and Varieties—over a wide field, but the information given under each sometimes rather meagre or too generalized to be of uch practical value to either the grower of trees or the mber merchant. For example, though Walnut is ferred to as being 'tender to late frosts, which some-mes blacken the leaves', no hint is given that the amage is serious and constitutes a major difficulty in tablishing Walnut in this country, nor is there any dication of the modern methods of overcoming the ifficulty, for example, by propagating late-flushing arieties or by special nursery technique. Similarly, he black spots on the leaves of Sycamore are described s a disease, without any indication that it is of no ractical importance. However, such criticism should ot be allowed to obscure the fact that these descriptions o contain much valuable information in a convenient rm, and it is probable that many of the gaps that one ould like to see filled remain empty simply because the ecessary information is not yet available.

In addition to the descriptions referred to above there re some sixteen introductory pages, in which an attempt is made to cover all the factors affecting the growth of trees, including methods of regeneration, as well as the structure of timber and the properties of wood. Within this space the amount of information possible under each heading is extremely restricted. For example, the whole subject of thinning is disposed of in about sixty words and the section on pruning can be reduced to the statement that some species retain their branches for a long time and stems selected to form the final crop may be pruned in early life.

There are also some sixty line drawings illustrating the structure of the more important woods and thirty full-page photographs at natural size of the longitudinal surfaces of various hardwoods and softwoods, and for the latter the end surface also is shown. These are intended to aid the reader to identify timbers. The drawings are at various magnifications, which, however, are not given, and are accompanied by notes on the special features to be looked for in each wood. Possibly these drawings may be intended to be looked through in sequence, in the manner of a key, though nothing is said to suggest this. Otherwise they might be rather misleading, as the cross-section drawings are not complete and show only those features that serve as special characteristics. For example, short parenchyma lines are shown in the drawings of Lime and Walnut, though by a different conventional method in each, but the parenchyma in Oak and Hornbeam is not shown at all. The drawings of the microscopic structure of the softwoods are open to serious criticism. In the first place reliance is placed on several features, such as the central or eccentric position of the resin canals in the rays, which are known to be too variable for such a purpose, and secondly the authors appear to be entirely unaware of the advances in the technique of identifying softwoods made by modern research such as E. W. J. Phillips' 'The identification of coniferous woods by their microscopic structures'. The drawings of the radial sections are inaccurate as regards the pitting between the ray cells and the vertical tracheids. For example, the borders of the pit-pairs in the radial walls of the parenchyma cells are shown in Lawson Cypress and Western Red Cedar, but are omitted from Spruce, Larch and Douglas Fir. There are also several inaccurate or ambiguously worded passages in the text, such as the following, in which the italics are the reviewer's:— ray tracheids 'are similar in *shape* to tracheids'; 'spiral or *annular* thickening is the most common form of thickening in the vessels'; 'Ash seed should be *kept* for a year before sowing, as it tends to lie dormant for the first year'; Sessile and Pedunculate Oak 'are *easily* identified by the fact that the Pedunculate Oak has its acorns borne on a *long stem* (botanically known as the "*peduncule*"), while the Sessile Oak has acorns *borne directly on the twigs*'.

The descriptions by themselves would have provided much useful information in a compact and relatively inexpensive form, and one cannot help regretting the addition of the other matter, and particularly the thirty large photographs, attractive as they are as pictures, as increasing the cost of the book out of all proportion to the practical value to the reader. L. CHALK.

31.1. *Structure. Anatomy. Identification*

31.1. RECORD, S. J. Keys to American woods (continued). *Trop. Woods* No. 78, 1944 (35–45).

This key refers to woods with septate fibres and is the thirteenth in the series. American woods with some or all of the fibres septate were found in 280 genera of 52 families, practically all of which were of tropical or subtropical origin. Only 142 of these genera are named in the key, mainly owing to the present difficulty of separating closely related members of certain families.

31.1 : 12.11.11. SANT RAM, B. **[Sapwood and its conversion into heartwood.]** With appendix and summary of debate. *Proc. 5th silvic. Conf. Dehra Dun 1939, Item* No. 17, 1941 (409–14, 415, 416–7).

For the proper utilization of some of the principal Indian trees yielding timber and valuable products it is necessary to know how heartwood is formed, what factors affect its formation, and in particular the silvicultural factors that can be controlled to increase or decrease the rate of heartwood formation according to requirements. This paper proposes details of a field and computation technique for collecting data on the proportion of heartwood, and the rate of transformation of sapwood into heartwood in trees with annual rings and without reliable annual rings. The investigation requires successive diameter measurements for a period exceeding the number of years taken in transformation to heartwood and can be carried out only in permanent sample plots.

31.1 : 33.38. WARNE, L. G. G. **Further observations on powdered wood charcoals.** *J. Soc. chem. Ind., Lond.* 63, 1944 (124). P.R.

A key for the identification of English wood charcoal powders, described in an earlier paper [cf. *For. Abstr.* 5 (181)], is extended and amended on the basis of observations of a further seven powdered hardwood charcoals.

31.1 : 33.38 : 12.25. WARNE, L. G. G. **British softwood charcoals.** *J. Soc. chem. Ind., Lond.* 63, 1944 (191–2). P.R.

Methods described by the author in earlier papers [cf. *For. Abstr.* 5 (181)] as suitable for determining the botanical source of British hardwood charcoals cannot be applied successfully to the identification of coniferous charcoals. Various features of possible diagnostic value are discussed, but it is concluded that the variation between genera in easily observed characters is too small to permit accurate identification.

31.1 : 12.25. BANNAN, M. W. **Wood structure of *Libocedrus decurrens*.** *Amer. J. Bot.* 31, 1944 (346–51). [Univ. of Toronto, Canada.] O.B.D.

Trends in anatomical variation in different parts of the tree resembled those previously described for *Thuja occidentalis* and *Juniperus virginiana* [cf. *For. Abstr.* 4 (31, 107)]. This was true for such characters as diameter of the tracheids, size and distribution of the intertracheary pits, size and number of pits per crossing-field, height and distribution of rays, and size of the ray cells.

Other characters usually considered valuable for diagnostic purposes likewise varied considerably. The tangential walls of the ray parenchyma cells and the transverse walls of the xylem parenchyma cells ranged from relatively thin in roots to thick in stems and branches, though it is noteworthy that in nearly all cases these walls had some development of bead-like thickenings. In possessing such wall thickenings *Libocedrus decurrens* resembles *Juniperus virginiana* and differs from many other Cupressaceae. However, such characters as the size and prevalence of intercellular spaces between the tracheids, the size and structure of the torus, the size of the ray cells, and the frequency of the rays may prove useful for separating these two conifers, if these various characters are used in combination rather than separately and the comparisons are between similar parts of the tree. *Author's summary.*

31.1. : 12.26–8 (54.8) : 12.11.11 : 34.26. RANGASWAMI, S. **[Sandalwood problems—factors affecting heartwood and oil content in Sandalwood.]** Paper (I). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 20 (b), 1941 (479–82).

31.1 : 12.26–8 (54.8) : 12.11.11 : 34.26. MITCHELL, J. E. M. **[Sandalwood problems—factors affecting heartwood and oil content in Sandalwood.]** Paper (II). With appendix. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* 20 (b), 1941 (482–7).

31.1 : 12.26–8 (54.8) : 12.11.11 : 34.26. VENKATA RAO, M. G. **[Sandalwood problems—factors affecting heartwood and oil content in Sandalwood.]** Paper (III). With summary of debate on *Item* 20 (b). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 20 (b), 1941 (488–9, 489–90).

Three papers record observed facts and opinions as to the effect of site factors and host plants on heartwood production and oil content in *Santalum album*, that by S. Rangaswami for Sandal areas in Madras, that by J. E. M. Mitchell for Coorg and that by M. G. Venkata Rao for Mysore, which together emphasize the paucity of authentic information on the subject.

31.2. *Physical Properties*

31.2 : 12.25–8. **[Light reflecting properties of woods.]** Crabtree Electrical Handbook. J. Crabtree and Co., Ltd. 1941.

On pages 64–5 of this book the light reflection factors for various materials are given in tabular form including the following woods:—

Surface	*Reflection factor per cent.*
Red Oak .	32
Poplar . .	47
White Pine .	61
Deal . .	45

31.22. Relation to Water, Air, Gases

31.22.2 : 31.23 : 12.25. COCKRELL, R. A. **Shrinkage and density of Ponderosa Pine wood.** *J. For.* 42, 1944 (288–90). [Univ. of California.]

Data obtained from a preliminary study of the shrinkage and density of wood of selected Ponderosa Pine trees of varying size and age, and growing under rather widely different conditions of stand and site, indicated that wood quality is more influenced by these latter conditions than by the fact that the trees are 'old growth' or 'second growth'.

31.23. Weight. Specific Gravity

31.23 : 31.8 : 33.32. HASLUND, O. **The relation of density to the quality of Pine wood and sulphite cellulose.** *Papir-J.* 30, 1942 (83–5). Chem. Abstr. 38 (1638). P.R.

31.27. Mechanical Strength

31.27 : 12.25–8 (94) : 11.11 : 33.15. SULZBERGER, P. H. **The effect of temperature on the strength properties of wood, plywood, and glued joints.** *J. Coun. sci. industr. Res. Aust.* 16, 1943 (263–5). P.R.

Solid wood specimens of six Australian species (*Eucalyptus gigantea, E. regnans, Litsea reticulata, Araucaria cunninghamii, Ceratopetalum apetalum, Elaeocarpus grandis*) and Sitka Spruce (*Picea sitchensis*) were tested at temperatures between – 10° C. and + 60° C., and a further nine Australian species (*Araucaria bidwilli; Flindersia pubescens, F. bourjotiana, F. brayleyana, Schizomeria ovata, Acacia melanoxylon, Phyllocladus rhomboidalis, Athrotaxis selaginoides, Doryphora sassafras*) were tested in the range – 10° C. to + 20° C. Temperature was found to have a marked effect on all properties examined: for all species the properties of maximum crushing strength parallel to the grain, modulus of rupture, modulus of elasticity and fibre stress at elastic limit decreased with increasing temperature; toughness tended to increase at higher temperatures but this effect varied between species; deflection at failure in static bending increases considerably for all species with increase in temperature.

Tests of $\frac{3}{16}$-in. Hoop Pine (*Araucaria cunninghamii*) 3-ply, made with hot-setting urea-formaldehyde, showed that the strength properties of this material decrease with increase in temperature, except for tensile strength and modulus of elasticity parallel and perpendicular to the grain of the outer plies for which no significant changes were observed.

Tests of casein, urea formaldehyde and phenol formaldehyde glues showed the shear strength of urea and phenol formaldehyde joints to decrease slightly through the temperature range – 10° C. to + 50° C., while casein joints increase in strength slightly at temperatures below 20° C. and considerably at higher temperatures.

31.27 : 12.26–8 : 31.22.1. KUSMIN, M. K. **Relation between impact strength and moisture content of Oak timber.** *Zavod. Lab.* 9, 1940 (1165). Brit. Chem. Physiol. Abstr. BI, 1944 (104). P.R.

The impact strength of timber at 15 per cent. and 30 per cent. moisture content is measured in undefined units.

ERRATUM

The reference for item 4 under "31.27" in *For. Abstr.* 6 (1) should read *J. Aero. Sci.* 10 (3), 1943 (81–5).

31.3. *Chemical Properties*

31.3. YORSTON, F. H. **Recent advances in the chemistry of wood.** *Pulp Paper Mag. Can.* 45, 1944 (266, 268).

A brief survey of the literature with special reference to work resulting in new fundamental knowledge that may have a bearing on pulp and paper technology; the subject is discussed under the headings:—cellulose; lignin and waste liquors; minor constituents. A list of 31 references is given.

31.3 : 31.22 : 12.25–8. CAMPBELL, W. G., and PACKMAN, D. F. **Wood as a causal factor in the corrosion of metals.** *Wood* 9, 1944 (99–101). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Metals that are placed in close proximity to moist wood may be corroded in a relatively short time. The moisture given off by wet wood is usually acidic, and when present in water films on a metallic surface the acids in question may either be the means of increasing the solubility of the primary corrosion product or give rise to a soluble salt of the metal. In addition, volatile substances other than water that are given off by wet wood may have a solvent action on preservative coating materials that are intended to protect the metal from corrosion. The drier the wood the less chance there is of such corrosion taking place.

It is difficult to classify wood species as either corrosive or non-corrosive, but, on the basis of experience under wet conditions and particularly where ferrous metals are concerned, the species that appear most liable to cause corrosion are English Oak, Sweet Chestnut, Western Red Cedar, and occasionally Douglas Fir.

31.3 : 33.02. JALAVA, M. **Quality investigation of pulpwood.** *Finn. Paper Timb. J.* (*Finsk PappTidskr.*) 25 (7), 1943 (96–107). *Chem. Zbl.* II, 1943 (584). Chem. Abstr. 38 (1109). P.R.

A discussion of the very different amounts of dry substance per unit weight of wood.

31.4. *Durability. Decomposition*

31.42. Attack by Plant Organisms

31.42.1 : 33.8. HEPTING, G. H. **Preventing decay in wood aircraft.** *Aero Dig.* 44 (4), 1944 (126–8, 142, 213).

The conditions under which decay will occur are outlined and the need for careful design of aircraft and storage crates alike is emphasized. Drain holes $\frac{1}{4}$ in. in diameter are said to be satisfactory and ventilation holes are recommended in enclosed components. Trouble due to condensation has not been experienced by the author.

31.43. Attack by Animal Organisms

31.43 : 12.25 : 13.2. PEMBERTON, C. E. **Entomology.** *Rep. Comm. Exp. Sta. Hawaii. Sug. Pl. Ass. 1942–43*, 1943 (14–8).

Carpenter bees (*Xylocopa varipuncta*, Patton), the extensive borings of which seriously weaken and disfigure soft timber, especially Redwood (*Sequoia*), used for posts and in buildings, were quickly eliminated by blowing cryolite dust into the tunnels; treated timbers have remained free of infestation for many months.

31.43 : 13.2 (410). FISHER, R. C. **A note on *Paratillus carus*, Newm. (Col., Cleridae) and records of its occurrence in Great Britain.** *Ent. mon. Mag.* 80, 1944 (132–4). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Instances are cited of the occurrence of the Australian beetle, *Paratillus carus*, on *Lyctus*-infested timbers in Great Britain. It seems probable that the insect was first introduced into this country on imported timbers infested with the powder-post beetle, of which it is a predator, and that it now tends to become acclimatized and established in the United Kingdom.

31.43 (54) : 13.2 : 33.36.1 : 33.92. **Some Indian insects and war materials.** *J. sci. industr. Res., India* 2, 1943 (44–8). I.H.

Reference is made to methods of controlling various insect pests which are causing enormous damage to military stores in India. Large stocks of tent poles were made unserviceable owing to infestation by *Sinoxylon* spp.; treatment by immersion in a hot oil mixture (creosote and up to 80 per cent. crude mineral

or vegetable oils such as rape, mustard, linseed or sesame) gave satisfactory protection, especially if followed by cooling off in cold oil. A quick dip or brush treatment of the remaining stores helped to prevent subsequent infestation.

Storage methods were drastically modified so that large solid stacks were replaced by small open stacks which, wherever possible, contained, and were interspersed with, an admixture of non-susceptible stores.

Similar methods have been effective against *Lyctus* beetle attack. Plywood infested with *Lyctus* has also been successfully treated by a one-minute soaking in boiling water.

Dinoderus borers infesting Bamboos are among the other pests dealt with.

31.45. Injury by Fire

31.45. NEALE, J. A. **Fire exposure tests of loaded timber columns.** *Bull. Res. Underwriters' Lab.* No. 13, 1939. pp. 23.

A report on tests made at the Chicago testing station of Underwriters' Laboratories Inc. using timber columns upon which a vertical load, in the form of a hydraulic press, was imposed during exposure to fire. In early tests failure occurred at the upper end of the column owing to rapid heating of the end in contact with a metal cap that was used; because of this local failure the full fire resistance of the timber cross-section was not developed. In more recent tests (using selected structural Longleaf Pine and Douglas Fir columns of 12 × 12 in. nominal cross section, in ordinary lengths) the ends were protected by reinforced concrete bearing caps of special design. These caps were found to protect adequately the upper ends of the columns, and the timbers sustained the fire and load tests for as long as 78–112 minutes. Failure was due to the weakening of the shaft portion of the column with the progressive charring or combustion of the wood.

31.46. Injury by Atmospheric Agencies, Water, etc.

31.46 (729.2) : 33.12 : 31.22.2. LEWIS, C. B., and SWABEY, C. **Notes on furniture cracking in Jamaica.** *Carib. For.* 5, 1944 (94–7). [E.span.]

Owing to abnormally low atmospheric humidity during the latter part of April, 1942, there was widespread warping, cracking, and splitting of furniture and other wooden articles in several localities. Some of the more important types of damage reported are discussed, and it is pointed out that when constructing any type of furniture for use in Jamaica allowance must be made for expansion and shrinkage.

31.8. *Quality and Defects of Timber*

31.8 : 31.21.33 : 07.7. **New 'slope of grain detector' aids aircraft and other designers to calculate lumber load values.** *B.C. Lumberm.* 27 (12), 1943 (54).

In numerous specifications covering the use of timber for aircraft manufacture and other purposes, designers are required to calculate load values in relation to the 'slope of grain' of the wood. To assist in the determination of grain direction, the Timber Engineering Company of Washington, D.C. has developed a 'slope of grain detector', a simple instrument that locates and traces the grain and thus allows of an accurate measurement of the deviation of the grain from a straight line running parallel to the sides of the member tested. The new instrument has a tracing needle which follows the grain on the surface of the wood, thus scribing a groove.

31.8 : 12.25 (68). **South African softwoods. Are they inferior to imported timbers of similar type?** *Timb. Tr. J.* 170, 1944 (60).

The prevalent idea that timber from South African *Pinus* species is inferior to imported softwoods, e.g. Baltic deal, is ascribed largely to the widespread use in South Africa of material from young trees and to inexpert seasoning.

32. HARVESTING OF WOOD. LOGGING

32 (66.9) : 12.26–8. DOMMEN, M. E. **Logging on Cameroons plantations, 1940–1942.** *Farm and Forest* 5, 1944 (44–5).

An account is given of logging operations in the Cameroons from August, 1940 to March, 1942. The species chiefly in demand were Iroko (*Chlorophora excelsa*) and Sapele Mahogany (*Entandrophragma cylindricum*), both of which are relatively plentiful, although thinly distributed, in the Likomba and A.F.C. estates, Tiko. Logging was begun on easily-accessible sites close to the railroad, hauling distances being normally less than ¼ mile. When an area was worked out the rail was lifted and used elsewhere. Selected trees were felled and cross-cut into logs of suitable lengths.

Vernacular names are given for nine of the most common tree species.

32.2. *Felling and Related Operations*

32.24 : 12.26–8 (47.3) : 33.36.3. AKINDINOV, M. B. Khranenie berezovykh bolvanok letney zagotovki dlya ruzheynykh lozh. [**Seasoning of gun-stock Birch blocks obtained from timber felled and fashioned in summer.**] *Lesnaya Prom.* No. 6, 1942 (8–11). [Russ.]

From the writer's investigations in the Ural it appears that satisfactory material can be obtained by felling and fashioning the timber in summer and seasoning the blocks in huts in the forest. Deformation and fungal attack were not serious, and the blocks were air dry after 40–50 days. Under the prevailing conditions summer felling was in no way inferior to autumn or winter felling, and was advantageous in that it allowed of quicker seasoning.

32.25.5 : 12.25. **Redwood bark yields to hydraulic jets.** *Timberman* 45 (6), 1943–44 (60).

Tests have proved conclusively that the bark of Redwood (*Sequoia sempervirens*) can be removed by the application of jets of water at high pressure.

32.29.2 : 43.02 : 23.13. MCCULLOCH, W. F. **Common sense approach to slash burning needed for effective forestry.** *B.C. Lumberm.* 28 (2), 1944 (27–8, 48, 50).

A general discussion based on experience gained in Douglas-Fir lands. It is suggested that in general, slash should not be burned where (1) less than 30 per cent. of the stand has been removed in felling operations; (2) the residual stand is composed of young or thin-barked trees; (3) the fire risk is not great in any case; (4) the soil is likely to be seriously damaged; (5) loss of advance growth will outweigh the gain of decreased fire hazard. It is stressed that slash burning which destroys the residual stand actually increases the fire hazard. Where burning is advantageous, a moderate burn is often both cheaper and better than a severe burn.

32.29.2 : 43.02 : 43.11 : 23.13. McCULLOCH, W. F. **Slash burning.** *For. Chron.* 20, 1944 (111–8).

An analysis of the effects of slash burning on forest protection and regeneration. Heavy burning is definitely detrimental; moderate burning can be applied in such a way as to reduce fire hazard without decreasing reproduction, though this requires experience and knowledge of local conditions, and no hard and fast rules can be laid down as to when burning is necessary.

Severe fires such as broadcast burns adversely affect regeneration through alteration in the structure, stability and moisture-holding capacity of the soil. Although fire hazard is always greater on unburned than on burned areas, the advantage in favour of the latter is only temporary and after 10 or 15 years is insignificant. In this connexion the importance of green cover in partially cut stands is demonstrated. Figures are given to show that where a large proportion of the forest cover is removed by logging, or killed by subsequent slash burning, more fires will occur, they will cover a wider area, and will be more difficult to control than where a higher percentage of forest cover is left intact.

Heavy burning results in an appreciable decline in seed production of the residual stand, and restocking is very much slower than in unburned areas. Both heavy burning and heavy concentrations of slash appear to retard reproduction; conditions of medium burning and medium slash areas result in an improvement in stocking, while best reproduction is on areas either very lightly burned or sparsely covered with unburned slash.

From the economic standpoint burning is shown to be more costly than other methods of protection, and in the less hazardous areas slash burning should be reduced to a minimum. Regeneration costs will generally be lower on the unburned areas, as will protection costs under conditions of moderate rather than heavy burning.

32.4. *Inventory and Evaluation of Felled Timber*

32.43.2 : 07.7. **Portable hydraulic log scale: newest equipment wrinkle.** *Timberman* 45 (7), 1943–44 (70, 72).

A log-weighing scale, which is accurate to within 300 lb. for loads up to 80,000 lb., is used for checking the weight of log loads to the rated capacity of the trucks carrying them. The scale is of simple construction, easy to operate, and portable.

32.8. *Grading and Storage of Wood in the Rough*

32.81 : 12.26–8. STONE, J. H., and STOTT, C. B. **How to grade hardwood sawlogs.** *J. For.* 42, 1944 (438–40). [U.S. Forest Service, Milwaukee, Wis.]

This article presents the basic information and describes the technique to be used in applying the standards developed by the U.S. Forest Products Laboratory, under which the quality of a log is decided by the clear distance between defects rather than by the number and size of the defects.

32.9. *Transport*

32.91.12 : 07.7. WAHL, H. F. **Modern tractor logging equipment.** *Loggers Handbook 1942* 2, 1943 (45–52). [Pacific Logging Congress, Portland, Oregon.]

An illustrated account of developments in modern logging equipment and its use in western North America. Subjects dealt with include the logging arch, the towing winch, the logging sulky, wire rope, yarding, and loading.

32.92–4. **Dryland log raft.** *W. Cst. Lumberm.* 71 (5), 1944 (32, 128).

The log raft described is built up of merchantable timber on a cradle and slipways ashore, and can be launched for transportation by sea whenever conditions are favourable. The raft, which can be constructed of either logs or sawn timber, is so designed that it can be broken up within a very short time on arrival at its destination.

32.95. FARRON, P.-E. Un nouveau système de téléférique pour bois de feu. [**A new ropeway system for fuel wood.**] *J. for. suisse* 95, 1944 (127–32 + plate). [F.]

Description of a very simple and light ropeway outfit patented in 1942 by MM. Maître frères & Girardin of Courgenay, Switzerland (*Swiss Patent* No. 223,193). The outstanding feature of this system is that the carrying cable itself is mobile. It is supported by double pulleys, usually moves at a speed of about 4 km. per hour, and can be fixed up in any shape and over any kind of terrain, as long as the gradient does not exceed 45° or the total length of the ropeway 2,000 m. Bundles of firewood held together by chains are suspended on the cable by means of steel hooks. The double pulleys guiding the cable are fitted into each other so as to permit the passage of the hooks. A small lorry engine of 4–6 h.p. is sufficient for the operation of the ropeway, which can be mounted and dismounted easily and quickly.

33. CONVERSION AND PRESERVATION OF WOOD

33.0. *Utilization Categories of Wood*

33.06. Fuelwood (including Firewood, Charcoal Wood, and Producer Wood)

33.06 : 33.36.3 : 32.24. KNUCHEL, H. Untersuchungen über Brennholzrüstung und Brennholzverwendung. Zweite Mitteilung. Weitere Ergebnisse von Trocknungsvesuchen mit zerkleinertem Laubholzreisig. [**Investigations on the preparation and utilization of fuelwood. Part 2. Further results of drying tests with chopped hardwood fagots.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 23, 1943 (133–66 + plates). [G.g.f.] E.F.A.

A continuation of the investigations noted in *For. Abstr.* 3 (141). Further seasoning tests with fuelwood sawn to short lengths, this time conducted at Neukirch, Schaffhausen, showed again that seasoning containers should be narrow, not exceeding 1 m. in width, and should preferably be made of poles and wire-netting. Drying is fastest when the wood is felled in winter and is cut up and seasoned during the spring.

33.09. Other Kinds of Log

33.09 : 12.25. LOEB, A. A. **Aspects of the ship knees business.** *W. Cst. Lumberm.* 71 (3), 1944 (41–2).

A brief account of the species and type of material required in the manufacture of ship knees, and of methods used in cutting and sawmilling such material. Second-growth Douglas Fir is the species most generally used for this purpose on the Pacific coast of North America.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

33.14. Match Manufacture

33.14 : 33.3. KLAPPROTH, H. (to Rudolph Koepp & Co. chemische Fabrik A.-G.). **Treatment of wood for matchsticks.** *German Patent* No. 733,708, March 4, 1943 (Cl. 38*h*. 2.01). Chem. Abstr. 38 (1118). P.R.

Wood is washed in a hot alkaline liquor to free it of incrustations, rinsed with acidified H_2O and dried at a moderate temperature. The wood is then hardened by treating it for 1–15 minutes at approximately 0° in concentrated, e.g. 78 per cent., H_2SO_4. The acid is washed out and the wood dried.

33.15. Manufacture of Veneers and Laminated Wood. Gluing

33.15. BARNES, J. S. **C.L.C.-T.D.A. lecture no. 4—plywood.** *Timb. & Plyw.* 86, 1944 (646, 650, 654, 666). P.R.

In this lecture the author discusses plywood with reference to its history and development, manufacture, grading, marketing and uses, both past and present, the adhesives and woods used in plywood manufacture, and sources of supply.

33.15. WORSCHITZ, F. Teoría y práctica de la industria maderera moderna. Resumen de directivas técnicas de una industrialización racional de las maderas. **[Theory and practice of the modern timber industry. Summary of technical principles underlying rational utilization of wood.]** *Maderil* 15 (170, 171, 172, 173, 174), 1942 (11–6; 11–6, 25–6; 13–6; 11–7; 11–6, 26–7); (175, 176, 177, 178), 1943 (60–5; 9–15; 14–6; 10–6, 25–6).

An outline of the general principles of plywood manufacture.

33.15 : 12.26–8. WEAVER, D. **News from Australia.** *Aeronautics* 11 (2), 1944 (41).

Coachwood (*Ceratopetalum apetalum*) ply is used in place of Birch ply in Mosquito aircraft construction, but otherwise the usual timbers are imported owing to a lack of suitable local alternatives. Coachwood ply has a shear strength of 1,850 lb./sq. in. compared with 2,100 lb./sq. in. for Birch ply.

33.15 : 31.27. YORGIADIS, A. J., and ROBERTSON, J. M. **Plywood characteristics disclosed by vibration tests.** *Aero Dig.* 45 (1), 1944 (76–7, 80–1, 196, 198, 201–2, 204).

The specimen, $\frac{1}{2}$ in. diameter × 4 in. to 8·5 in. long, was attached by chuck and collet connexion to two weights both of which were supported on rollers and were free to move parallel to its axis. Varying tension and compression stresses were induced in the specimen by means of contra-rotating out-of-balance weights fixed to one main weight. All tests were run at resonance. Nine plywood specimens of various densities and veneer thickness were used, 7 in Birch, 1 in Gum (*Liquidambar styraciflua*) and 1 in Poplar, and one control specimen in solid Birch to give comparable results.

For all specimens the classical relationship held, as it has been proved to do for metals and plastics

$$D = CS^3$$

where D = damping capacity
C = constant for material (damping coefficient)
S = applied maximum stress.

Comparison with results of other tests show that the damping capacity of wood is greater than that of metals but that it is not so high as that of plastic materials. The dynamic modulus (E) is probably about 30 per cent. higher than the static modulus.

33.15 : 33.8. **Plywood tubes.** *Rev. sci. Instrum.* 14, 1943 (380–1). [Plymold Corporation, Lawrence, Massachusetts.] P.O.

'Plytube', developed by the Plymold Corporation, is a light-weight plywood tubing which has found a variety of uses during the past year, e.g. in the manufacture of sectional life-raft oars and radio-antenna masts. Four types of veneer are used and the lay of the winding is adjusted to meet specific requirements. Urea formaldehyde is used as a bonding agent. Plytube is at present manufactured with internal diameters ranging from $\frac{1}{2}$ in. to 24 in. and with wall thicknesses of 0·05 in. to 0·50 in. The tubes take on the resistant properties of the bonding agent and are flame-proof, splinter-proof, rot-proof, and water-proof. Their electrical conductivity is low and they are dimensionally stable under extreme temperature variation. Special coatings make them adaptable for use as containers or conduits for petrol, chemicals, oils, etc. They have a high strength/weight ratio.

33.15 : 33.8 : 12.25 : 12.26–8. HISCOCKS, R. D. **Plastic plywoods in aircraft construction.** *Engng. J., Montreal* 27, 1944 (4–8).

Recent work at the structural laboratory of the Aeronautical Division of the National Research Council of Canada is described in detail. A lucid analysis of some of the structural problems involved in wooden aircraft design is given, together with descriptions of some novel methods of overcoming them. A monocoque plywood rear fuselage was made for the Harvard aircraft: the manufacture of this is described, the detail design illustrated and the results of tests to destruction are recorded. The results of tests to find the minimum bend radius for Birch and Spruce veneers are given in graphical form. Also *Aircraft Engng.* 16 (184), 1944 (176–82).

33.15 : 38.1 : 33.36.1–2. HUNT, G. M. **Laminating structural timbers: some words of caution.** *Sth. Lumberm.* 168 (2112), 1944 (61–3).

The writer discusses briefly the advantages, uses and economic limitations of laminated timbers, the relative value of various adhesives that are available for laminated construction, and the requirements in equipment and technical training for developing the most efficient manufacturing processes. The possibilities of applying preservative and fire-retardant treatments to laminated timbers are indicated.

33.15 : 31.23. **Veneer thickness conversion table.** *Emp. For. J.* 22, 1943 (121).

Equivalents in inches (decimals and fractions) and millimetres are given for different thicknesses of veneer, and approximate weights in lb./sq. ft./mm. of thickness are given for plywoods of Birch, Douglas Fir and Gaboon (*Aucoumea klaineana*).

33.15. **Stop nut for plywood.** *Engng. News-Rec.* 131, 1943 (130, 132). [Elastic Stop Nut Corp. of America, Vauxhall Rd., Union, N.J.] P.O.

A new self-locking fastener devised for use on plywood construction is easy to install and can be used on plywood from $\frac{1}{8}$ in. up. This nut leaves the outside

of the plywood surface smooth, provides a washer surface, does not twist in the hole, is replaceable in the event of damage, is independent of the thickness of the wood, and requires no special tool to affix'.

33.15. **[Ardux—a hot-setting liquid adhesive for cementing laminated or moulded materials.]** *Aero Res. tech. Notes, Bull.* No. 18, 1944, pp. 4. P.R.

33.15. **Plywood moulding.** *Aircraft Prod.* 6, 1944 (262).

In the Thaden process of gluing, the material is placed against an accurate mould; pressure is applied through a rubber bag interposed between the material and another mould of approximately accurate shape, the gap between the two moulds being as small as possible. Dry air is used to apply pressure and the small quantity used reduces the risks involved. Heat is applied through electrical resistance strips.

33.15. **Rapid identification of the type of glue used in plywood.** *Flugsport* 35 (15), 1943 (240).

33.15. ALLWOOD, A. W. **Electric heating in plywood manufacture.** *Discovery* 5 (6), 1944 (183–4).

High frequency heating is simply explained.

33.15. BENDER, F. and SCHNETZLER, K. **Laminated plastic, plywood, etc.** *Canad. Patent* No. 415,383, Sept. 28, 1943. Chem. Abstr. 38 (1047). P.R.

In order that the adhesive may be heated electrically, it is made electrically conducting by adding alkali compounds of fatty acids and higher alcohols, sulfonated fatty acids and their alkali salts, sulfonated oils and waxes, metal oxides or sulfides, etc.

33.15. CHULITSKII, N. N. **'WIAM-B3' adhesive for wood aircraft construction.** *Aviapromyshlennost'* No. 10, 1940 (58–63). *Chem. Zbl.* II, 1941 (149). Chem. Abstr. 38 (1044). P.R.

A report is given of a phenol-HCHO resin adhesive, 'WIAM-B3', which is highly resistant to water and fungi, has a joint strength of 110 to 130 kg. per sq. cm., and can be used at room temperature.

33.15. GRIERSON, R. **Wooden spar production.** *Aircraft Prod.* 6, 1944 (337–44).

A method for curing urea formaldehyde glue used in Mosquito aircraft spar production is described in detail. Grooves in Spruce blocks carry 34SWG wire through which a 25-volt current is passed. The block is faced with ply and forms the heating unit and pressure pad for spar web to flange gluing. A diagram of the electrical circuit is given.

33.15. NARAYANAMURTI, D., RANGANATHAN, V., and ROY, D. C. **Studies on adhesives. Part VII. Rape seed protein formaldehyde dispersions as plywood adhesives.** *Indian For. Leafl.* (*Utilization*) No. 58, 1943. pp. 7. [Forest Research Institute, Dehra Dun.]

Tests have shown that satisfactory adhesives, having good dry and wet strengths, can be made from rape seed proteins. Investigations were made to determine the effect of various factors such as the quantity of formaldehyde used, pressure applied in plywood construction, etc., on the strength of the adhesive.

33.15. RANGANATHAN, V., and ROY, D. C. **Studies on adhesives. Part VIII. Adhesives from oil seed cakes and whole seed meals.** *Indian For. Leafl.* (*Utilization*) No. 59, 1943. pp. 5. [Forest Research Institute, Dehra Dun.]

Adhesives developed from whole seed meals and oil cakes have been found to be satisfactory for use with cheap commercial plywood but are not water resistant.

33.15. PERRY, H. W. **High frequency bonding of laminated wood.** *Aircraft Engng.* 16 (183), 1944 (147–9).

Data are given on high frequency units and their use in the manufacture of 'Duromold', together with a detailed description of the wing spar production methods used.

33.15. PERRY, T. D., and GRINSFELDER, H. **Resin adhesives for aircraft.** *Abstr.* in *Aircraft Engng.* 16 (184), 1944 (155).

The development of glues is traced from the early bone and hide glues to the present-day resins. The various resin glues now available are described and their application is discussed.

33.15 : 31.22.1. FORSSMAN, V. H. **Plywood.** *German Patent* No. 714,779, Nov. 13, 1941 (Cl. 38*h*. 2.01). Chem. Abstr. 38 (1822). P.R.

Hygroscopic substances are added to the glue used for gluing the layers of wood. The amount of these substances is calculated to impart to the plywood a moisture content of 8–12 per cent.

33.15 : 33.36.3. NONKEN, G. C. **Electronic heating of nonconductors.** *Paper Tr. J.* 118 (8), 1944 (23–5). P.R.

A discussion of the factors that affect the use of high-frequency heating in the processing of relatively thick, non-metallic materials such as plastics, wood, plywood and bonded paper.

33.15 : 33.8. **Electronic heating of plastic bonded moulded plywood.** *Aero Dig.* 44 (4), 1944 (104, 106, 108, 132, 136).

The methods employed by the Fairchild Corporation in the manufacture of wooden aircraft are described with particular reference to gluing technique.

33.15 : 38.2. **Wood upon wood.** *Engineer, Lond.* 177 (4625), 1944 (163).

Modern developments in laminating and gluing techniques as they affect design of large structures are outlined and discussed.

33.15. **Improved wood.** *Prod. Engng. Bull.* 3 (19), 1944 (253–6).

The possible uses of this material are outlined for the benefit of potential users.

33.15. BAKELITE LTD. **Impregnation of wood with resin.** *British Patent* No. 549,335, Nov. 17, 1942. Chem. Abstr. 38 (846). P.R.

The wood is first soaked in water to remove soluble salts, and is then soaked in an aqueous solution or dispersion of synthetic resin. Without introducing any precipitating agent, the impregnated wood is subjected to drying. The synthetic resin used is obtained by treating phenol, cresol, resorcinol, urea or thiourea with CH_2O or paraformaldehyde and stopping the reaction before the resin has become water-insoluble and before polymerization has taken place to any marked extent.

33.15. BERLINER, J. F. T. **Chemically transmuted wood.** *Timber of Canada* 4 (10), 1944 (27–30, 33, 62, 64, 66, 68).

The impregnation of wood with resin-forming methylolurea results in a product having properties fundamentally different from those of untreated wood. When sufficiently treated the wood becomes markedly harder, stronger, stiffer and more durable, it no longer

tends to swell or shrink with change in humidity, and the tendency to shred and splinter during sawing, planing, cutting and turning is reduced. The application of the process on a commercial scale appears to be practicable and should greatly extend the usefulness of the more easily available, lower-cost woods. A brief description of the process, and of the materials and equipment used, is given in the present paper. [See also *Timberman* 45 (8), 1943–44 (26–9, 56).]

33.15. CASSELMAN, R. **Resin impregnation of wood.** *Modern Plastics* 21 (3), 1943 (124–6, 168). P.O.

Of the two main types of resin-treated wood, 'impreg' is made by impregnating wood, usually veneers, with a synthetic resin solution, drying and baking at 250° F., and then bonding the veneers; 'compreg' is made by impregnating, drying, and then densifying under heat and pressure with steam platens. The present paper discusses the effects of the resin on the working properties of the wood, the types of resin used in the manufacture of 'improved' wood, and possible developments in its utilization.

33.15. KLEIN, L., GRINSFELDER, H., and BAILEY, S. D. **Comparison of methods for improving wood.** *Industr. Engng. Chem.* (*Industr. Ed.*) 36, 1944 (252–6). P.R.

Methods in use for improving the physical properties of wood by densification are: (1) impregnation with phenol-formaldehyde resin, followed by compression of the wood to attain dimensional stability and improved strength; (2) interleaving of veneers with resin film followed by the application of heat and pressure; (3) applying liquid resin to veneers with glue spreaders followed by heat and pressure. In the present paper data are given for purposes of comparing the strength and other properties of the materials resulting from each method, a summary of the properties rated for each type of improved wood being as follows:—

Property	*Impregnating process*	*Film-bonding process*	*Glue-spreading process*
Simplicity and uniformity of production	3*	1	2
Ease of compression	2	3	1
Dimensional stability—			
Water	1	3	2
Heat	3	1	2
Impact strength	3	1	2
Tensile and compression strength, moduli of rupture and of elasticity in bending	2	1	3
Shearing stress parallel to grain—			
Perpendicular to laminations	2	1	3
Parallel to laminations	1	1	1
Machinability, glueability, paintability	3	1	2
Surface appearance	1	3	2

* 1 = best; 2 = intermediate; 3 = poorest.

33.15 : 33.8. WHITE, J. R. **Propellers in pregwood.** *Bakelite Rev.* Jan. 1944 (3–5).

The methods used in America for the manufacture of resin impregnated and compressed wood airscrews are briefly outlined.

33.17. Sawmilling

33.17 : 07.7. CHAMBERLAND, H. J. **Some facts concerning band saws.** *Aero Dig.* Aug. 1943 (232, 234, 307). P.O.

From tests at U.S. aircraft factories it appears that under certain conditions hardened-tooth saws are more efficient and cheaper in use than ordinary saws. Hardened-tooth band saws, better known as 'contour saws', have teeth milled and set with 0·001-in. accuracy. Their long life is due to heat treatment which results in a maximum hardness being obtained at the extreme tips of the teeth.

33.17 : 07.7. HAYCOCK, A. H. **Principles of machine woodworking: [I.] Circular rip saws. [II.] Circular cross-cutting saws.** *Wood* 9, 1944 (114–6, 127–30, 160–3, 181–3).

Notes on operation and maintenance.

33.17 : 07.7. **Filer perfects automatic device for heat tensioning saws.** *W. Cst. Lumberm.* 71 (5), 1944 (65).

33.3. *Chemical Treatment*

33.3. POETTER, N. **Wood used as a material for chemical apparatus.** *Chem. Technik* 16 (9), 1943 (81–2). *Abstr.* in *Engrs. Dig.* 5 (5), 1944 (152).

The action of various chemicals on wood is discussed and particular applications of wood in chemical apparatus are described.

33.3. MOSKOVITS, I. **Fodder cellulose.** *Mon. Bull. agric. Sci. Pract., Rome* 33, 1942 (408T–20T). A.P.B.

The disproportion between the low nutritive value of wood and straw and the relatively high value of some of their constituents has led to attempts, particularly in times of fodder scarcity, to remove the lignified portion of these materials by means of physical or chemical treatments, thus rendering the nutritive elements digestible to animals. Disincrusted straw or cellulose has been shown to possess almost the same calorific value and the same effective physiological power as starch. When properly fed, fodder cellulose, obtained by the disintegration of wood or straw, is digestible by horses and ruminants, but not by pigs. The albumin and vitamin content is nil, and it is therefore essential that sufficient of these substances should be added to the feed in order to ensure that the animals receive an adequate diet.

The author discusses the processes most commonly used in the production of fodder cellulose, its digestive and nutritive value, the technique and practice of feeding, production costs, and the extent of production in different countries.

33.32. Pulp and Paper Manufacture. Plastics

33.32 (485) : 98.1. JAHN, E. C. **Notes on the Swedish pulp and paper situation.** *Paper Tr. J.* 118 (9), 1944 (27–9). P.R.

A report is given on the current situation in Sweden with regard to wood supply and pulp and paper production, and technical developments are discussed briefly.

33.32 (73) : 34.6 : 12.25–8. MCGOVERN, J. N., and MCGREGOR, G. H. **Sulphite pulp production—some factors pertinent to meeting war born shortages.** *Paper Tr. J.* 117 (27), 1943 (28–34). [U.S. Forest Products Laboratory, Madison, Wis.] P.R.

Following a survey of possible ways of increasing pulp production under existing conditions it is suggested that (1) non-critical pulping species, and logging, sawmill and veneer-mill wastes be utilized to the full extent of their availability; (2) advantage be taken of dense woods giving high yields per wood volume; (3) the pulping process be conducted in conformity with known principles for maximum pulp production; and (4) fibre losses from chip preparation and pulp treating and bleaching be minimized.

The authors discuss briefly the pulping procedures applicable to species less commonly used for sulphite pulping, including Aspen, Cottonwood, Birch, Maple, Gum, Beech, Northern Pines, Tamarack, Western Pine, Larch, Douglas Fir, Southern Pine, Western Red Cedar, Sitka Spruce, Alder, and mixed species. Variables affecting sulphite pulp production are considered in detail, and general observations are given on methods of reducing fibre losses in wood and chip preparation, pulp washing, screening, and bleaching. *From authors' summary.*

33.32. BUEVSKII, A., and PODGORNYKH, A. **Sulfite cooking of wood freed from hemicellulose.** *Bumazhnaya Prom.* No. 11, 1940 (49–54). *Khim. Referat. Zhur.* 4 (7/8), 1941 (117). Chem. Abstr. 38 (1110). P.R.

In order to study separately the hydrolysis of hemicelluloses and the delignification of wood, sawdust was hydrolyzed by boiling with a reflux condenser with 1·5 per cent. H_3PO_4 or 2 per cent. H_2SO_4 before cooking with sulphite liquor. Preliminary hydrolysis of hemicelluloses resulted in a retardation of delignification by sulphite cooking. Increasing the time of cooking to 14 hours did not produce satisfactory results. The experiments indicate that the nature of lignin changed considerably by the acid hydrolysis.

33.32 : 34.24. FORMAN, L. V. **The kraft pulping of southern tannin rich woods.** *Abstr.* in *Pulp Paper Mag. Can.* 45, 1944 (387).

A large supply of tannins for the leather industry is obtained by extraction of tannin-bearing wood prior to manufacture of paper-making pulp. Many species growing in southeastern United States are rich in tannins and may be potential sources of raw material for this dual purpose.

An investigation of the kraft pulping characteristics of several of these species has been made. The specimens were classified in three groups: those containing tannin in the wood and bark, those with tannin only in the bark, and those having no tannins.

Some of the species which are known to have tannins suitable for leather processing in quantities adequate to permit commercial recovery were found to produce pulp having strength properties similar to normal hardwood kraft pulps.

33.32. OFFERMANNS, F. Muskauer fortlaufendes Verfahren zum Aufschluss von Holz und Einjahrespflanzen. **[The 'Muskau' continuous process for the pulping of wood and of annual plants.]** *Papierfabrikant* No. 2, 1943 (57–60). [G.] P.R.

A process has been developed by the author that is claimed to simplify and cheapen the pulping, whether alkaline or acid, of wood and material from annual plants, such as straw. The process is characterized by a continuous and automatic movement of the raw material through the various stages of manufacture.

33.32 : 34.6. HILL, E. H. **Substitutes for round Pine wood in making alkaline pulps.** *Abstr.* in *Pulp Paper Mag. Can.* 45, 1944 (386–7).

Laboratory tests were made to determine the value of sawmill sawdust of different ages, chip screen rejects, sawmill slabs, shavings, etc., as substitutes for round logs in pulp production. Comparable figures for weights of materials used, pulp yields, cooking conditions, cost, etc., are tabulated.

The cooks were made in a small experimental digester with a capacity of about 30 pounds of moisture-free chips. The regular mill cooking liquor was used for the cooks, and standard TAPPI methods were employed for evaluating the quality of pulp produced from the different materials. The principal criticisms of the Pine slabs, chip screen rejects and sawmill sawdust had to do with the dirt content of the pulp produced, the low strength characteristics, and the amount of sand introduced into the cooking system from these materials.

With reference to strength characteristics, those of lower, those pulp from chip screen rejects 14·0 per cent. lower, those of pulp from chip screen rejects 14·0 per cent. lower, and those of pulp from sawmill sawdust 40·0 per cent. lower than those of pulp made from Pine logs. It was found that new sawdust gave slightly higher yields and better strength characteristics than sawdust that had been allowed to age.

Calculated on the basis of making 400 tons of pulp per day from these materials, there would be 20 pounds of sand added from Pine logs; 720 pounds from the Pine slabs; 4,200 pounds from the chip screen rejects, and 1,800 pounds from the sawmill sawdust.

The cost of the wood materials necessary to make a ton of air-dry pulp are as follows: $17·55 for Pine logs; $20·90 for Pine slabs; $4·69 for chip rejects, and $10·24 for the sawmill sawdust. Possible damage to the equipment used and the actual need for raw materials of this kind should be considered by each individual mill before substituting these for round logs.

33.32 : 12.25. **Effect of chip length on quality of wood pulp.** *Sth. Pulp Paper J.* 6 (10), 1944 (24).

An experiment was made in the manufacture of pulp from Southern Pine by the sulphate process in which for each of twenty cooks all factors were kept constant except the length of the chips which varied from ¼ in. to 1¼ in. The smaller chips gave a lower yield, a much softer and lighter pulp and a lower percentage of screenings. Burst strength was as high for pulps made with ¼-in. chips as for those made with larger chips.

33.32 : 12.25. CHESLEY, K. G., and ROBERTSON, N. F. **The effect of small chip sizes in sulphate pulping.** *Abstr.* in *Pulp Paper Mag. Can.* 45, 1944 (387)

A study of the effect of small chip sizes on yield and strength characteristics of sulphate pulp from Loblolly and Shortleaf Pine has been made. Chips from the wood room operation were screened in the laboratory and pulped under one set of conditions with mill liquors in a pilot digester. Four chip sizes were studied: those retained on a 1-in. screen; through 1-in., retained on ½-in. screen; through ½-in., retained on ¼-in. screen; and through ¼-in., retained on ⅛-in. screen. Comparisons of yield and strength characteristics are shown.

The effect of adding rejected chipper fines to laboratory screened chips was also studied. The chips were screened to a definite size ratio and pulped in various proportions with chipper fines retained on and passing through a ¼-in. screen. The pulps were cooked to permanganate numbers of approximately 20 and 30 by varying the cooking time and per cent. active alkali. Comparisons of yield and strength characteristics of these pulps are also shown.

The effect of bark on yield, permanganate number, and strength properties of pulp is discussed.

33.32 : 12.25–8 (92). BAHRFELDT, K., and SPOON, W. **Suitability of Dutch Indian woods for the manufacture of paper.** *Ber. Hand Mus. kolon. Inst. Amst.* No. 188, 1943. pp. 31. *Chem. Zbl.* II, 1943 (494). Chem. Abstr. 38 (1109). P.R.

The majority of the deciduous trees showed practically the same chemical analysis as Beech wood. Many were not very suitable for pulping because of their low density; these included *Anthocephalus cadambu, Hibiscus similis, Magnolia blumei, Shorea eximia, S.* sp. *damar kelipik, S.* sp. *merkvejoeng*, and *Trema orientale*. Practically all of the coniferous woods were suitable, yielding good kraft paper; many were tested on a semi-commercial scale; especially valuable, because of their long fibres, were *Agathis alba, Pinus insularis, P. merkusii, Podocarpus amara* and *P. imbricata*. The pulp from *Callitris calcarata* is difficult to size because of the ethereal oil, which gives the pulp a decided odour; the paper gradually loses the odour but later crystals of guaiacol separate. Many pulping and analytical details are given.

33.32. SHERRARD, E. C., and HARRIS, E. E. (to the Secretary of Agriculture of the U.S.A. and his successors in office). **Simultaneous production of pulp and hydrogenated products from lignocellulose.** *U.S. Patent* No. 2,328,749, Sept. 7, 1943. Chem. Abstr. 38 (1113). P.R.

33.32 : 33.31. SOHN, A. W. **The disintegration of wood, annual plants and lignites with $NaClO_2$.** *Zellwolle, Kunstseide, Seide* 48, 1943 (78). *Chem. Zbl.* I, 1943 (2652). Chem. Abstr. 38 (1109). P.R.

By means of $NaClO_2$ celluloses can be prepared which contain little lignin, an optimum amount of hemicelluloses and an unchanged degree of polymerization. Thus wood yields a white cellulose of maximum strength.

33.32 : 31.3. MCKEE, R. H. **Cellulose and lignin: recovery from wood.** *British Patent* No. 560,492, April 6th, 1944. Brit. Cotton Ind. Res. Ass. Summ. 24, 1944 (245). P.R.

Wood or other lignified cellulose material is digested for about 12 hours at a temperature of 150° C. with a hydrotropic solvent comprising an aqueous solution of a readily soluble salt of an aromatic acid derived from a single benzene ring. At the end of this treatment the cellulose is filtered from the accompanying liquor, which contains lignin in solution in the state in which it originally occurred in the wood. The cellulose is washed, preferably with the hydrotropic solvent in diluted condition, and may then be bleached by customary methods. The cooking solution, after the separation of the cellulose therefrom, is used again, preferably six or seven times, after which it is diluted with at least three times its volume of water to precipitate the lignin. The lignin is filtered and washed, and can then be used for various industrial purposes.

33.32 : 34.26. WOHL, A. (to Margarete Rühl (née Wohl) and Käte Leroi (née Wohl)). **Treating resinous wood.** *German Patent* No. 734,771, March 25, 1943 (Cl. 55*b*. 1.01). Chem. Abstr. 38 (1366). P.R.

Coarsely chipped resinous wood is cooked in H_2O or a very dilute acid. The floating resin is separated, the wood is pressed once or twice and the cooking is repeated. After the resin is finally separated the wood is treated in alkaline solutions and converted to pulp.

33.32 (71.1) : 33.15. SMITH, I. C. **Plastics and synthetic resins for post-war B.C.** *B.C. Lumberm.* 28 (2), 1944 (29–30, 44, 46).

In the opinion of the writer there are good possibilities in British Columbia for developing an industry that would produce goods made of wood and plastics, such as plastic-bonded plywoods, both flat and moulded, laminated dimension timbers, and 'compregnated' wood, i.e. wood saturated with synthetic resin plastics in liquid form and possessing unusual strength qualities. With the growing shortage of timber it may also prove feasible to use plastics as bonding agents for producing large-size timbers from smaller material, for plugging knot holes, etc. In addition, paper-resin laminations, which find a ready market in the manufacture of aircraft doors, refrigerator panels, etc., might be produced.

33.34. Dyeing and Bleaching of Wood

33.34 : 33.02. CRAIG, K. A. (to Paper Patents Co.). **Bleaching Poplar groundwood.** *Canad. Patent* No. 416,018, Oct. 26, 1943. Chem. Abstr. 38 (1113). P.R.

Groundwood contaminated with fungus rot is treated with an alkaline hypochlorite solution, e.g. aqueous solution of $CaOCl_2$ and NaOH, at about 25–60°, with sufficient hypochlorite to provide 5–20 per cent. available Cl based on the groundwood, and then acidified to pH about 5·0–5·5 with aqueous H_2SO_3.

33.36. Preservation of Wood. Seasoning and Drying

33.36.1. *Preservation against Attack by Plants and Animals*

33.36.1 : 33.31. CARSWELL, T. S. (to Monsanto Chemical Co.). **Insecticide suitable for treating green logs and green lumber.** *U.S. Patent* No. 2,327,338, Aug. 24, 1943. Chem. Abstr. 38 (846). P.R.

An alkoxypolychlorobenzene, such as butoxypentachlorobenzene is used (suitably in solution or in an aqueous emulsion).

33.36.1 : 33.31. FINDLAY, W. P. K. **Wood tar as a preservative for timber.** *Emp. For. J.* 22, 1943 (151–3).

Tests were made to determine the toxicity to wood-destroying fungi of various wood tars in comparison with that of coal-tar creosote. Toxicity of the wood tars varied considerably, although even the least effective of the samples tested would probably be sufficiently

toxic for use as a wood preservative if a reasonably good penetration could be obtained. While some types of wood tars are sufficiently liquid to penetrate wood fairly easily, others are highly viscous and would be difficult to use in their raw state for wood impregnation. Certain diluents may be used for reducing the viscosity of these tars, though it is suggested that using a distillate of the wood tar is more convenient. The use of some wood tars for wood preservation is limited by their high content of tar acids which corrode the treating plants.

33.36.1 : 33.31. FLENNER, A. L., KAUFERT, F. H., and SALZBERG, P. L. (to E. I. du Pont de Nemours and Co.). **Ethyl Hg pentachlorophenolate and its use for preserving wood, etc.** *U.S. Patent* No. 2,331,268, Oct. 5, 1942. Chem. Abstr. 38 (1340). P.R.

Et Hg pentachlorophenolate is made by reaction of Et Hg phosphate with Na pentachlorophenolate and may be used in a very dilute solution for preserving wood or other cellulosic material.

33.36.1 : 33.31. GIESEKING, E. **Impregnation of wood.** *Chem. Tech.* 16 (10), 1943 (93–4). Build. Sci. Abstr. 17 (n.s.), 1944 (41). P.R.

The author distinguishes between the preservative treatment of wood in exposed and in protected positions. In the former case the preservative treatment is distinct from paint coatings, whereas in the latter one coating can serve both purposes. Surface coating with preservatives is not effective to any depth, but, even so, it is at present regarded as the most important means of wood protection.

33.36.1 : 33.31. GROSSIUS, T. **Chemical preservative for protection against mould and insects.** *Vegyi Ipar és Kereskedelem* (*Chem. Ind. Handel*) 4 (6), 1942 (2–4). *Chem. Zbl.* I, 1943 (2742). Chem. Abstr. 38 (1860). P.R.

A review on wood impregnants and impregnation methods and their testing.

33.36.1 : 33.31 : 31.43 : 13.2. HATFIELD, I. **Research tests on soil-poisoning chemicals for the control of subterranean termites.** *Pests* 12 (3), 1944 (10–4). Biol. Abstr. 18 (12091).

The author concludes that pentachlorophenol and mixture of it with trichlorobenzene are among the best treatments studied.

33.36.1 : 33.31. HOFFMANN, E. **Preservative for wood.** *Canad. Patent* No. 416,657, Nov. 30, 1943. Chem. Abstr. 38 (1089–90). P.R.

A stable, viscous, tacky paste contains a water-soluble preservative penetrating the wood by osmosis, a paste-forming non-glutinous binder such as bentonite, resins, oils or pitches, and water, e.g. 45 lb. of coal-tar creosote, 10 lb. of bentonite and 45 lb. of a dry mixture of NaF 65, $K_2Cr_2O_7$ 25 and dinitrophenol 10 parts.

33.36.1 : 33.31. HUBER, R. (to Allgemeine Holzimprägnierung G.m.b.H.). **Impregnating wood.** *German Patent* No. 732,284, Jan. 28, 1943 (Cl. 38*h*. 2.01). Chem. Abstr. 38 (846). P.R.

Wood is impregnated with solutions of F salts and acid-reacting alkali or alkaline earth polyphosphates.

33.36.1 : 33.31. PFANNER, J. (to Cirine-Werke Böhme and Lorenz). **Impregnating wood.** *German Patent* No. 732,126, Jan. 28, 1943 (Cl. 38*h*. 2.01). Chem. Abstr. 38 (846). P.R.

Wood is impregnated with an aqueous solution of $NH_4Cl.ZnCl_2$ to which is added pyridine or a water-soluble pyridine homolog.

33.36.1 : 33.31. ROCHA AZEVEDO, P. DA. **Influence of the phenols of creosote on the preservation of wood.** *An. Ass. Quím. Brasil* 2, 1943 (97–108). Chem. Abstr. 38 (1087). P.R.

Test pieces of Parana Pine [*Araucaria angustifolia* (= *brasiliana*)] were treated with (I) commercial creosote containing 6 per cent. of phenol; (II) the same after distilling off substances boiling below 250°; (III) gas oil to which enough of the creosote distillate was added to give it a phenol concentration of 8 per cent.; and (IV) gas oil, exposed under humid conditions to the action of fungi (*Lenzites*, *Fomes* and *Polyporus* spp.). I and II showed equal preserving efficiency; protection afforded by III was not satisfactory and by IV still less so. It is concluded that creosote as a wood preservative need not contain the tar acids (phenols, cresols, naphthols).

33.36.1 : 31.42.12. **Sap stain control.** Monsanto Chemicals, St. Louis, U.S.A. [1944?] pp. 17.

The technical details of 'Santobrite' (sodium pentachlorphenate) and recommendations for handling it are given.

33.36.1 : 31.43. CEYLON. **Silvicultural research administration 1942.** [Ceylon Forest Department.] 1943. pp. 8.

A comprehensive set of experiments undertaken to determine the possibilities of controlling or preventing deterioration of logs and sawn material of Malaboda (*Myristica dactyloides*) by borers and stain fungi showed *inter alia* that: (1) Attack by borers was 3 to 4 times as severe on unbarked as on barked logs and no form of treatment was effective in preventing such attack. (2) Logs immersed in water for 6 months, sawn immediately on removal and stacked for seasoning, produced clean sound planks free from decay but liable to borer attack. (3) Planks brush-treated with lime wash, 10-per-cent. hot aqueous solution of borax, and cold solutions of Ascu (¼ lb. per gal.) or sodium silicofluoride (5 per cent.) immediately after being sawn, and then stacked for air seasoning, showed little damage from borers (p. 7).

33.36.1 (73) : 33.4 : 33.52. SHIPLEY, G. B. **The wood preserving industry and the conservation of forests: a review of the lumber, cross tie, and wood preserving industry in the United States, 51-year period (1890–1940).** [Koppers Company, Pittsburgh 19, Pa.?] 1942. pp. 36.

33.36.1 : 33.52–3. LEFKOF, E. A. **Preservative treatment of wood such as railway ties or telegraph poles.** *U.S. Patent* No. 2,329,774, Sept. 21, 1943. Chem. Abstr. 38 (1090). P.R.

A treatment is employed which involves subjecting the wood for about 3·5 hours to immersion in a liquid preservative, such as a coal-tar product, in a sealed chamber, at a temperature of about 210° F. and under a pressure of about 200 lb. per sq. in., lowering the pressure, while the wood is still submerged, to approximately atmospheric pressure, but keeping the temperature of the preservative constant, maintaining the lowered pressure for about a half hour, again subjecting the wood, while submerged in the preservative, to a pressure of approximately 200 lb. per sq. in. for about 3·5 hours while maintaining the temperature of the preservative constant; and repeating the stated cycle of

treatment before withdrawing the wood from the treating chamber.

33.36.1 : 33.53 : 33.36.2. **Electrolytic treatment averts pile infestation.** *Elect. World, N.Y.* 119, 1943 (2117–9). L.S.

An account is given of the technique and materials used in the preservative treatment of piles and posts with copper by an electrolytic process. Piles submerged in salt water for 17 years after treatment were found to be sound and free from infestation. The process appears to harden the wood and, in addition, to reduce its fire hazard.

33.36.1 : 33.53. YOUNG, H. W. **Timber 'copperplated' to frustrate worms.** *Compr. Air Mag.* 48, 1943 (7060–2). P.O.

Note on a process developed within the last two years on a commercial scale by the Olympia Wood Preserving Company of Olympia, Wash., and used chiefly in the treatment of wood piling for the U.S. navy. In principle, the process consists in introducing into the timber free copper, which constitutes a cathode. The timber is placed in an electrolytic tank where the electrolyte consists of a copper-sulphate solution, which penetrates the outer shell of the wood as it seeks to establish contact with the cathode. It is stated that true and lasting impregnation is secured over the whole surface to a depth of $\frac{3}{4}$ in., thus creating an effective barrier to marine borers. Treated piles contain not less than 3 oz. of metallic copper per cu. ft.

33.36.1 : 33.54. BLEW, J. O. **Increase the life of fence posts and farm timbers.** New York State College of Forestry, Syracuse, N.Y. 1941. pp. [11].

Instructions are given for the preservative treatment of fence posts and timber by the open-tank process, using coal-tar creosote as the preservative.

33.36.2. *Fireproofing*

33.36.2. **The fireproofing of timber.** Timber Development Association, Ltd., 75, Cannon St., London, E.C.4. 1944. pp. 32.

Practical information is given on modern methods of treating timber to increase its resistance to fire, including notes on the most effective salts (ammonium phosphate, ammonium sulphate, boric acid, ammonium borate, ammonium chloride, and magnesium chloride) used for impregnating timber in fire-retarding processes. Surface-coating methods are also described. Useful data are brought together in the appendixes as follows:– (I) Testing fire-resistance—fire-endurance tests. (II) Testing fire-resistance—acceptance tests. (III) Testing fire-resistance—precision methods. (IV) Classification of timbers according to general property of fire resistance. (V) Proprietary fire-retardants and processes. (VI) Manufacturers of fire resisting paints and finishes.

33.36.2. CLARKE JONES, N. **The fire proofing of wood.** *Chem. & Ind.* No. 11, 1944 (98–9).

Under the headings 'surface coatings' and 'impregnation' the author gives details of the various chemicals used for the fireproofing of wood and their properties. Brief notes are given on methods of testing treated wood and treatment costs.

33.36.2. METZ, L. **Fire protection of wood.** *Chem. Tech.* 16 (10), 1943 (94). Build. Sci. Abstr. 17 (n.s.), 1944 (42). P.R.

Three regulation fireproofing materials, the first on a salt basis, the second based on water-glass, and the third based on alkali-carbonate, are recognized in Germany as being suitable for indoor use. The third has the advantage compared with the first (at present somewhat scarce) in protecting wood from fungal attack without attacking iron. Fireproofing materials sufficiently durable for the treatment of wood exposed to weather conditions have not yet been developed.

33.36.3. *Seasoning. Drying*

33.36.3 : 12.25. BROPHY, M. J. **Prevention of checks in air-seasoning thick White Pine.** Forest Products Laboratories, Dominion Forest Service, Ottawa. 1941. pp. 4.

Checking is caused by the too rapid drying and shrinking of the surface layers of the lumber in comparison with the interior. In addition to the established practices in air seasoning, the following points are made to assist lumbermen in preventing this type of degrade: (1) Lumber of uneven lengths should be box-piled in order to avoid an overhang at the rear of the pile; (2) lumber of a variety of widths should be piled close together (not touching) at the sides of the pile, leaving a single flue 8–12 in. wide in the centre; (3) relatively thin cross pieces should be used; (4) lumber cut in the early summer is less susceptible to checking than that cut in the autumn—special precautions must be taken with the latter. Closer piling of the lumber in the top of the pile may be of advantage as drying takes place more quickly there than at the bottom.

33.36.3 : 31.8. MOTTET, A. L. **Determination of case hardening in kiln dried lumber.** *Timberman* 45 (5), 1943–44 (28–9).

The method described gives an exact determination of casehardening, and is as simple to apply as the prong test. One-inch cross-sections are cut from the stock to be tested; these are resawn into strips about $\frac{1}{4}$ in. thick, which are dried to a uniform final moisture content of less than 10 per cent. The curvature of individual strips is measured by placing them along a straight edge from the midpoint of which projects at right angles a rule graduated to $\frac{1}{64}$ in. Allowable deflections have been determined for different widths of stock and are tabulated.

33.37. Distillation. Manufacture of Tar

33.37 : 12.26–8. RUZICKA, L., BOER, A. G., and REY, E. **Triterpenes LXXXVI. Birch-tar oil.** *Helv. chim. Acta* 27, 1944 (183–6). Brit. Chem. Physiol. Abstr. A II, 1944 (165). P.R.

Technical birch-tar oil is extracted successively with dilute HCl, Na_2CO_3, NaOH, and H_2O, boiled with 10 per cent. NaOH–EtOH, and distilled.

33.37 (47.2–6). DRUCE, J. G. F. **Russian progress in wood distillation.** *Industr. Chem. chem. Mfr.* 20, 1944 (117–8). P.O.

A brief note based on recent papers. Twelve references are cited.

33.37 (81). SPITZNER, R., and CHIOCARELLO, P. **The domestic [Brazilian] wood-distillation industry.** *Rev. Quim. ind., Rio de J.* 12 (133; 134), 1943 (14–5, 17; 19–25). Chem. Abstr. 38 (850). P.R.

A wood distillation installation, with a capacity of 10 cu. m. of wood per 24 hours, is described and its operation is discussed.

37–8 : 12.26–8 (44). GIVAUDON. Cellulosehaltige nnstoffe. [Cellulose-containing fuels.] *Usine* 52), 1943 (7). *Chem. Zbl.* II, 1943 (1769). P.R.
A short review of the tree species available in France the possibility of their utilization in distillation and rcoal manufacture.

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-Gas Generators

38.1 : 07.7. **Brick-walled charcoal kilns.** *Indian .. Leafl.* (*Chem. & minor For. Prod.*) No. 54, 1943. 8 + plates. [Forest Research Institute, Dehra n.]
A detailed account is given of the method of nstruction and operation of brick-walled kilns, with rticular reference to those used in Nilgiris, the ical brick kilns of Natal, and the Siamese type of s used in the Matang mangrove reserves in Malaya.

38.1 (54) : 07.7. **Metal charcoal kilns.** *Indian For. fl.* (*Chem. & minor For. Prod.*) No. 55, 1943. pp. 4 plate. [Forest Research Institute, Dehra Dun.]
Details are given on the construction and operation a portable metal kiln, the 'Frikiln', which was igned at the Forest Research Institute, Dehra Dun, meet Indian conditions. It is pointed out that while ge metal kilns have a high initial cost they possess a mber of distinct advantages over other types of kiln.

38.1 (68) : 12.26–8. **Active carbon from Wattle bark.** *gineering* 158 (4101), 1944 (126).
Research at the South African Fuel Research titute, Pretoria, has resulted in the preparation of a hly active carbon from Wattle wood. The product eing used for oil regeneration and decolorizing.

38.2 : 31.22.1. SCHIMANECK, E. **Automatic mixers producer gas engines.** *Engrs. Dig.* 5 (4), 1944 (120–2). str. in *Auto.-tech. Z.* 46 (13–4), 1943 (327–38).
The difficulty of burning wood of 45 per cent. isture content is noted, and a unit in which it has en found possible to do this is illustrated.

38.2. **Producer gas charcoal.** *Engineer, Lond.* 176, 43 (391). O.R.S.
In South Africa the Forest Products Institute and the el Research Institute have prepared specifications a charcoal suitable for use in gas producers, having e following maximum contents:—Volatile matter, 14 r cent.; tar, 0·05 per cent.; ash, 3 per cent.; moisture, 8 r cent. The charcoal must be free of impurities, rd, as free of dust as possible, and individual particles ould be ½–1½ in. in size.
A brick kiln has been designed for producing charcoal meet these requirements; it costs £8 to £25, is simple construct and operate, gives a uniform product thout ash, and can convert 5 tons of wood into high-ade charcoal in 18–25 hours.

38.3 (62–4) : 33.06 : 12.26–8. GREENE, H., and WITT, T. N. **Charcoal briquettes as locomotive fuel.** *ture, Lond.* 154, 1944 (58–9). [Agricultural Research stitute, Anglo-Egyptian Sudan.]
An account of experiments in the manufacture of arcoal briquettes from local materials and of their e in full-scale fuel trials for locomotives in the Anglo-yptian Sudan. Charcoals available are made from *acia arabica, A. seyal* and *A. mellifera.* Successful as were made with briquettes conforming closely to e following percentage composition: charcoal, 75; pitch, 8; fuel oil, 8; gum arabic, 4; water (lost at 105° C.), 4. The coarser the charcoal used the less efficient were the results, and it was found that the grinding of charcoal to a suitable powder was the most difficult problem in briquette manufacture.

33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. COREY, A. J., and MOORE, T. R. **The saccharification of wood for ethanol production.** *Pulp Paper Mag. Can.* 45, 1944 (167–70).
Hydrolysis of wood in dilute and concentrated acids is discussed from the standpoint of producing wood sugars for fermentation into alcohol. The Bergius and the Scholler processes are described as examples of the most modern concentrated and dilute acid processes respectively, and the relative merits and disadvantages of the processes are compared. Current laboratory developments in wood saccharification are also considered briefly. Production of alcohol as an end product of saccharification process is indicated to be uneconomical under normal trade conditions, but discovery of an economical means for disposing of the by-product, lignin, would go far toward placing the wood saccharification industry on a sound basis. *Authors' summary.*

33.39. DIAKOVA, and MELENTIEVA. **Liquid fuel from wood: the tetralin process.** *Russ. J. Appl. Chem.* 15, 1942 (173, 237). *Chem. Age, Lond.* 50, 1944 (359). O.B.
A new process for transforming solid into liquid fuel, based on the dissolution of coal in tetralin or phenol at high temperature and pressure, has now been applied to wood, peat and similar substances. Some 40–50 per cent. of the total organic matter of sawdust and cellulose was dissolved in tetralin, forming in about equal proportions a volatile (boiling below 200°) and a 'non-volatile' fraction.

33.39. SHARKOV, V. I. **An irrigation method for the hydrolysis of wood.** *Lesnaya Ind.* No. 10/11, 1940 (56–60). *Khim. Referat. Zhur.* 4 (7/8), 1941 (117). Chem. Abstr. 38 (863). P.R.
In the proposed continuous irrigation method of hydrolysis, the wood material heated to the reaction temperature (160–80°) is sprayed continuously with diluted mineral acid heated to the same temperature. This method accelerates the process considerably and yields up to 50–60 per cent. of reducing sugars. The theoretical fundamentals of the irrigation method of hydrolysis are described.

33.5. *Pitprops, Sleepers, Poles and Other Roughly Converted Wood*

33.51 (71) : 31.42.11 : 33.36.1 : 98.1. HARKOM, J. F. **From forest to mine.** *Timber of Canada* 4 (8), 1943–44 (18–9, 29). [Dominion Forest Service.]
In general the production of round mining timber in Canada is for home consumption only, the amount used varying from 4½ million cu. ft. (1932) to over 8½ million cu. ft. (1940). In addition a large quantity of lumber and sawn timber is used by the mines in Canada, the total estimated for 1943 being 120 million bd. ft. Notes are given on the species and sizes of timber used in mines, on the life of timber under mining conditions and on some of the preservative treatments used.

33.52. JOHANSEN, F. C., and LOACH, J. C. **The strength of railway sleeper assemblies. Parts I to IV.** *Engineering* 158, 1944 (1–3, 41–2, 81–2, 141–3).

33.6. *Packing Boxes, Crates, etc.*

33.6. **Containers for war.** *J. For.* 42, 1944 (408–11).

A brief account of war-time problems in packaging and of developments in the design and use of containers to meet new requirements. A large proportion of these are manufactured from lumber, plywood and paper products.

33.8. *Other Manufactured Products*

33.8. DONNY, J. **A tube-cutter method for making bobbin blanks.** *Sth. Lumberm.* 168 (2107), 1944 (53–4).

Experimental tests have been made on a method for cutting round bobbin blanks direct from the bolt by means of a tube saw. The chief advantage of such a method is reduction in waste, the yield being increased theoretically by 40–50 per cent. by cutting rounds directly from the log instead of first ripping the log into squares. The operation of the tube saw and its possible commercial applications are discussed briefly.

33.8. FAIRHURST, L. G. **Wooden blades.** *Flight* 45 (1853), 1944 (697–8).

The commercial value of wooden airscrew blades is discussed. They are lighter than metal blades, with which they are interchangeable, and are easier to repair.

33.8. RABIN, J. **Use of wood in the construction of distilling columns.** *An. Ass. Quim., Brasil* 2, 1943 (121–5). Chem. Abstr. 38 (897). P.R.

Small-scale and semiplant experiments indicate that wooden columns for alcohol distillation have about the same efficiency in continuous operation and prospects of longer life than Cu columns. The column should be made of long staves to avoid transverse joints at the plates and may be filled with Raschig rings.

33.8. STEVENS, J. M. **Problems of construction and alternative substitution of wood in aircraft.** *Trans. Amer. Soc. mech. Engrs.* Feb. 1944 (155–9).

The general problems of use of wood on aircraft are described and the need for co-operation between the raw material producer and the user is stressed. The use of alternative species of wood is strongly advocated.

33.8 : 12.26–8. HUNN, J. V. (to the Sherwin-Williams Co.). **Cocobola wood for making knife handles or the like.** *U.S. Patent* No. 2,330,826, Oct. 5, 1943. Chem. Abstr. 38 (1307). P.R.

33.8 : 12.26–8. JACKSON, W. L. **Wooden tyres for farm vehicles.** *E. Afr. agric. J.* 9, 1944 (188).

This note describes the construction of a type of wooden tyre made from dry Mueri (*Pygeum*) which has been used successfully in dry weather on the back wheels of a heavy trailer. It is believed that the wood of Red Thorn (*Acacia laliae*) or Satinwood (*Fagara*) would give even better results. The cost for the wooden tyre is only about 8 per cent. of that for a rubber tyre and tube.

33.8 : 33.15. **Saving and the substitution of critical materials.** *Engrs. Dig.* 5 (4), 1944 (113–4). *Abstr.* in *Tech. mod.* 35 (17/18), 1943 (133–6).

Among the many items on view at a recent exhibition in Paris were rain gutters in 'Bakelised' wood fretted with steel wire to replace zinc and wooden tubes.

33.8 : 33.15. BILHUBER, P. H. **High frequency heating applied to aircraft woodwork.** *Aero Dig.* 43 (4), 1943 (178–82, 184, 186, 235).

The advantages of the 'stray field' method are described together with some of the particular problems in the use of high-frequency heating for aircraft assembly work. The illustrations show well the jigs, fixtures, plant and safety devices used in the production of C.G.4A glider parts.

33.8 : 33.15. JOHNSON, A. **Weber glider wing production.** *Aero Dig.* 44 (1), 1944 (122–4, 136, 139)

The production of C.G. 4A glider wings at the Weber Showcase and Furniture Co., Los Angeles, is described. Optimum conditions in the assembly shop have been found to be 80°–85° F. and 45–65 per cent. relative humidity. These are now controlled automatically. Urea formaldehyde glues are used, and infra red heating units used on assembly reduce the glue curing time from 8 hours to 1½ hours. The units used consist of two 250-watt carbon lamps and need no attention while working.

33.8 : 33.15. HESS, R. W. **The trend of wood use in aircraft.** *Abstr.* in *Aircraft Engng.* 16 (184), 1944 (154).

The factors influencing the use of wood in aircraft are discussed in (non-technical) detail, and probable future uses are outlined.

33.8 : 33.15. WALLACE, J. J. **The use of wood in aircraft design and construction. Part II.** *Aero Dig.* 44, (1), 1944 (78–9, 83, 139, 141–2).

Some of the problems involved in the design and construction of wooden aircraft, using flat or moulded plywood, are discussed. The advantages gained by using fluid pressure techniques are said to have been exaggerated. By using 'carefully selected commercial timber' in place of 'aircraft lumber' it is estimated that lumber costs may be cut by 10 per cent.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

34.21. Fodder Grass and Grazing

34.21 : 12.19.3. CANFIELD, R. H. **A short-cut method for checking degree of forage utilization.** *J. For.* 42, 1944 (294–5). [Southwestern Forest and Range Exp. Sta].

34.24. Tanning Materials. Cork

34.24 : 12.14.8 : 12.26–8. EDWARDS, C. P., and NIERENSTEIN, M. **A new Hamameli-tannin.** *Pharm. J.* 151, 1943 (241). [Bristol Univ.] L.C.S.

The description is given of a γ-hamameli-tannin isolated from the bark of *Hamamelis virginiana* grown in England. It is the third known crystallizable hamameli-tannin.

34.24 (54) : 12.26–8. DAS, B. M. **South African Wattle bark and its Indian substitutes.** *J. sci. industr. Res., India* 2 (3), 1944 (196–204).

The economics of the Indian tannin industry, and the cost and availability of the various possible Indian substitutes for Wattle bark, are discussed. The following table is constructed from data given in the text:—

Vernacular name	*Scientific name*	*Per cent. tannin*	*Per cent. tannin easily extracted*	*Per cent. soluble non-tannin*
South African Wattle	*Acacia mollissima* *A. decurrens* var. *mollis*	30– 45	25	7
Madras Wattle	—	35–47	—	—
Travancore Wattle	—	27	—	—
Babul	*A. auriculata*	12	8	8
Babul Pods	„ „	12–19	—	—
Avaram	*Cassia auriculata*	17	10	—
Goran	*Ceriops roxburghiana*	35	—	—

4.24 : 12.26–8 (496). Eine Untersuchung über Korkeiche. [**An investigation on cork-yielding Oaks.**] *Orman ve Av* 14, 1942 (90–1). [Turk.] *Abstr.* in *Z. Weltforstwirt.* 10, 1943 (284–5). [G.]

Report on an investigation to determine the possibilities of producing cork in Turkey. It was found that existing stands of *Quercus cerris* are sufficiently extensive to satisfy most domestic requirements. *Q. suber*, which yields better cork, does not occur in Turkish forests, but it should be possible to establish plantations of this species.

4.24 (61) : 12.26–8. WYLIE, N. A. **Cork forests in Tunisia.** *Quart. J. For.* 38, 1944 (10–4).

An account of the forests of *Quercus suber* and *Q. mirbeckii* which occur on the coastal mountain range in the northwest corner of Tunisia. Generally speaking, the Cork Oak is found in the drier areas while the 'Chêne Zéen' is confined to the moister ground, but here are broad zones where the two species grow in mixture. Here *Q. mirbeckii* tends to suppress the more valuable Cork Oak. In the forest around Ain Drahan (the centre of the range, and about 3,000 ft. above sea level) there is a 12-year stripping cycle, one-third of the trees being stripped every fourth year.

34.25. Christmas Trees. Medicinal Plants. Edible Plants

4.25 : 23.21 : 12.25 : 23.24.2 : 24.51 : 12.11.22. COPE, W. A. **Notes on Christmas tree farming.** *J. For.* 42, 1944 (250–4).

The four species Norway Spruce (*Picea abies*), White Spruce (*P. glauca*), Balsam Fir (*Abies balsamea*), and Douglas Fir (*Pseudotsuga taxifolia*) have been grown for sale as Christmas trees on the Allegany Plateau, southern New York (elevation 1,600 ft., soil: Volusia) with the following results: Norway Spruce and White Spruce have shown fairly rapid growth and are readily marketed, but the first-named species is highly susceptible to insect attack; the very slow growth and poor form of Balsam Fir has caused it to be eliminated from later plantings; best all-round results have been obtained with the Rocky Mountain variety of Douglas Fir, which shows fairly rapid growth and good form, holds its needles well, and has not been attacked by insects.

Planting technique, pruning for tree form, and the problem of hardwood competition in plantations are discussed briefly. Fairly young (3- to 6-ft.) Norway spruce trees have been reproduced vegetatively by cutting the tree just above the lowest whorl of branches. At the end of a year all these laterals will be erect; they are allowed to grow for 2–3 years when all but one are cut, the single remaining tree being ready for harvesting at the end of 6 years. Alternatively, one of the adventitious buds which develop at the top of a Norway Spruce stump may be used for the second-crop tree, the lateral branches of the lowest whorl being used to supply food for the sprout before they are all removed. Only one case of true layering by Norway Spruce has been observed.

34.25 : 12.25. VILLELA, G. G. **Vitamin C in the needles of some conifers.** *Science* 99 (*n.s.*), 1944 (125). [Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.]

Investigations were made on the vitamin C content of 'Pine tea' made from the needles of five coniferous species. The results are summarized in the following table:—

No. of samples	*Species*	*Mg. per 100 ml. of the extract*	
		Ascorbic acid	*Dehydro-ascorbic acid*
5	*Araucaria angustifolia* (*brasiliana*)	2·7	1·0
5	*Podocarpus sellowii*	3·3	1·3
1	*Podocarpus lambertii*	2·8	1·9
2	*Araucaria excelsa*	0·5	0·8
1	*Pinus excelsa*	2·3	1·0

The amount of ascorbic acid present is small, but it may be of significance in countries where vitamin C is not readily available.

34.25 : 12.26–8 (67.6). BALL, R. S. **Pyrethrum cultivation in Kenya.** *Bull. imp. Inst., Lond.* 42, 1944 (13–24).

The great expansion of the pyrethrum industry in Kenya in recent years is largely due to the high toxicity of the Kenya flowers, the high average yields per acre, and to efficient methods of preparation and marketing. This article outlines the chief conditions necessary for the successful cultivation of the plant, and discusses such factors as soil preparation, planting stock, transplanting, weeding, and the harvesting of the crop. Highest yields (900–1,000 lb. of dry flowers per acre per annum) are obtained on medium loam soils at altitudes above 8,500 ft. On rich forest soils with a high humus content, or at elevations below 7,000 ft., yields may be considerably lower. The average yield for the Colony is about 400 lb. per acre per annum.

34.25–6 : 12.14.7 : 12.26–8. PATEL, C. B. **Chemical investigation of seed oil of *Moringa concanensis*.** *Curr. Sci.* 12, 1943 (272–3). [Industrial Chemists' Laboratory, Baroda.] L.S.

On extraction with ether the seeds of *Moringa*

concanensis yield on an average 38 per cent. of yellowish-coloured oil suitable for medicinal purposes and for lubricating delicate machinery. The oil has a faint pleasant odour. Its refractive index at 40° C. is 1·4624; acid value (in terms of oleic acid), 2·61; saponification value, 189·3; iodine value (Wy's method), 79·25; R.M. value, 0·57; P. value, 0·26; acetyl value, 23·1; and unsaponifiable matter, 1·095.

34.25–8 : 12.29. DAHLGREN, B. E. **Economic products of palms.** *Trop. Woods* No. 78, 1944 (10–35). [Chicago Natural History Museum.]

A comprehensive review of the various uses of Palm products, including materials such as the wood, leaves, leaf stalks, sheaths and buds, fruits and seeds, which are derived from structural parts or elements of the plant, and substances like sugar (from the sap), starches, oils, alkaloids, waxes, gums and resins, which are manufactured within the plant. Generally speaking, the most characteristic Palm products are of the first group, and many of both groups are chiefly of local importance. Oils, waxes and rattans, however, are products of great significance in world commerce.

34.26. Resin. Gums. Turpentine. Oils. Rubber. Latex. Dyestuffs. Sugar

34.26 : 12.26–8 (68). ***Euphorbia tirucalli* resin from South Africa.** *Bull. imp. Inst., Lond.* 42, 1944 (1–13).

Investigations show that the resin of *Euphorbia tirucalli* can be used in the preparation of short oil storing varnishes that would have a commercial outlet in the manufacture of waterproof fabrics and leather finishes.

The latex of this tree has been considered a potential source of rubber, but, as the result of recent work carried out in South Africa, the authorities consider the cost of production too high even under present conditions of rubber shortage.

34.26. CLINE, McG. (to Wood Process Co.). **Apparatus for treating crude oleoresinous materials such as crude Pine oleoresin for effecting purification.** *U.S. Patent* No. 2,328,891, Sept. 7, 1943. Chem. Abstr. 38 (1131). P.R.

34.26 : 12.26–8. MASON, C. F. **Water dispersible and bulking gums. I. Gum arabic.** *Chem. Ind.* 53, 1943 (680–2). L.S.

An account is given of the origin, properties and uses of gum arabic which is obtained from various species of *Acacia*.

34.26 : 12.11.11. LOTSKAR, H., and MACLAY, W. D. **Pectin as an emulsifying agent. Comparative efficiencies of pectin, tragacanth, karaya, and acacia.** *Industr. Engng. Chem.* (*Industr. Ed.*) 35, 1943 (1294–7). [Western Regional Research Laboratory, U.S. Department of Agriculture, Albany, Calif.] L.S.

Pectin as an emulsifying agent is compared with gums tragacanth, karaya, and acacia in a study of aqueous emulsions of olive, cottonseed, and mineral oils under various conditions of acidity, ratio of oil to water, and concentration of agent.

34.26 : 12.14.5 : 12.25. HÜLSCHER, J. **Emulsions of Fir-needle oil.** *Seifensieder-Ztg.* 70, 1943 (9–10). Chem. Abstr. 38 (1849). P.R.

A description of the composition and preparation of various known commercial products containing this ingredient.

34.26 : 12.29 (86). GALINDO, A. R. **Informe del Inspector de Bosques Nacionales. [Report of the Inspector of National Forests.]** *Tierras y Aguas* 4 (25), 1941 (5–26). [Span.]

A report on the prospects of intensified utilization of oil-producing palms in the various regions of Colombia.

34.26 : 12.14.7 : 12.25–8. BALAVOINE, P., and TERRIER, J. **Analysis of some oily seeds.** *Pharm. Acta Helv.* 18, 1943 (272). Chem. Abstr. 38 (1655). P.R.

The analyses of the oils from *Cytisus alpinus*, *Juglans rupestris*, *Cirsium spinosissimum*, *Rosa alpina*, *Prunus domestica*, *Pinus pinea* and *Robinia pseudoacacia* are tabulated.

34.26 (62.4) : 12.14.7 : 12.26–8. HENRY, A. J., and GRINDLEY, D. N. **The oils of the seeds of *Ocimum kilimandscharicum*, *Euphorbia calycina*, *E. erythraeae*, *Sterculia tomentosa*, and *Trichilia emetica*.** *J. Soc. chem. Ind., Lond.* 63, 1944 (188–90). [Wellcome Chemical Laboratories, Sudan Medical Service, Khartoum.] P.R.

In a survey of oil-bearing seeds of the Sudan of potential economic importance, the oils contained in the seeds of the above plants have been examined in considerable detail and their principal constants determined. The oils present in the seeds of the first three have strong drying properties and are satisfactory substitutes for linseed oil in paints. The oils present in the kernel and husk of the seeds of *Trichilia emetica* contain a high proportion of saturated fatty acids and are therefore excellent soap-making oils, especially valuable in a country like the Sudan where semi-drying oils vastly preponderate and no hydrogenation is carried out. The presence of a bitter principle in these oils has been confirmed and it has been shown that a normal caustic soda refining removes the bitter principle in the 'acid oil', leaving an oil free from objectionable taste. The oils contained in the seeds of *Sterculia tomentosa* closely resemble those of *S. foetida* of the East Indies. *Authors' summary.*

34.26 : 12.14.7 : 12.26–8. STEGER, A., and LOON, J. VAN. **Fungu- or behurada oil.** *Fette u. Seifen* 49, 1942 (769–70). Chem. Abstr. 38 (1655). P.R.

Fungu- or behurada oil is obtained from the seed of *Purinarium campestre*, a tree native to Surinam. The oil content of the kernel extracted with petroleum ether is 65 per cent., but only 2·6 per cent. based on the weight of the seed, because of the high percentage of husk. The composition and properties of the oil are given; the low linolic acid content of this oil makes it unsuitable as a substitute for linseed or tung oils.

34.26 (54) : 12.26–8. GRIFFITH, A. L. **The growing of *Cryptostegia grandiflora* as a war time emergency plantation crop.** *Indian For. Leafl.* (*Silviculture*) No. 64, 1944. pp. 10. [Forest Research Institute, Dehra Dun.]

The subject is discussed under the headings: choice of plantation site, seed, method of regeneration, nursery practice, plantation technique, injuries and protection, rate of growth, and cost.

34.26 (729.4) : 12.26–8. FENNEL, T. A. ***Cryptostegia* rubber—its rebirth and development.** *Rubber Age* 54, 1944 (329–32). Haitian-American Agricultural Development Corp.] L.S.

A brief account is given of developments in connexion with the rubber production drive in Haiti where it was expected by the end of 1943 to have between 60,000 and 85,000 acres of land cleared and planted with *Cryptostegia grandiflora* and to bring 10,000 acres into production early in 1944.

26 : 12.26–8 (72 : 76.4 : 79.1 : 79.4). PERRY, E. L. **owing rubber in California.** *J. For.* 42, 1944 (324–31). .S. Forest Service, Los Angeles, Calif.]

An account is given of early investigations of the ober-producing plant Guayule (*Parthenium argenta-n*) in Mexico and the southwestern States, and of the velopment of the war-time project for large-scale oduction of rubber from this plant. On unirrigated nd the optimum economic rotation is about five ars, production on good land at this age being up to 300 lb. of rubber per acre. A somewhat shorter tation may be possible under conditions of controlled igation. Notes are given on the present research ogramme and the process used in extracting rubber om Guayule, and consideration is given to the future ossibilities of this plant for the production of rubber n a commercial scale.

4.26 (728.1) : 12.26–8. AGUILAS, J. I. El hule y estra flora. **[Rubber and our flora.]** *Rev. agric., uatemala* 20 (10/12), 1943 (19–33). [Span.] *Abstr.* in *rop. Woods* No. 78, 1944 (47).

An annotated list of the latex-yielding trees and hrubs growing in Guatemala. They represent 16 enera of four families, namely Moraceae (3), Apocyna-eae (4), Euphorbiaceae (4), and Sapotaceae (5).

4.26 : 12.26–8. LISSYZIN, D. I., and SAMSEL, N. V. Guttapercha v kore korney i stebley bereskletov. **[Gutta percha in the bark of roots and trunk of Spindle rees, *Euonymus verrucosa* Scop. and *Euonymus elutina* F. et M.]** *Biokhimiya* 8 (4), 1943 (182–7). [Russ.] Biol. Abstr. 18 (7331).

The gutta-percha content was estimated in the bark of different parts of the roots and trunks of *Euonymus errucosa* and *E. velutina*. In the trunk bark the gutta-percha content increases downwards, remaining, how-ever, very low even in the lower parts of the trunk close to the root. It increases markedly in the root bark, attaining a maximum in its upper parts, but decreases in the younger peripheral parts of the root. The gutta-percha content in the bark of the roots increases with age; the resin content decreases.

34.26 : 12.26–8 (86). GALINDO, A. R. Los Palos Brasil de Colombia. **[The 'Brazil woods' of Colombia.]** *Carib. For.* 5, 1944 (84–93). [Span.e.]

A note on the chief dyewoods of Colombia. These are *Haematoxylon campechianum*, *H. brasiletto*, *Poinciana insignis*, *Coulteria tinctoria*, and the Redwoods, which include species of *Caesalpinia*, *Pterocarpus*, *Peltophorus*, and *Baphia*.

34.26 (71.4) : 12.26–8 : 60.31.2. DELISLE, R. L'aménagement de l'érablière. **[The management of Maple groves.]** Service Forestier, Ministère des Terres et Forêts, Québec. 1943. pp. [4]. [F.]

Brief recommendations are made for the benefit of maple-syrup producers.

34.27. Seeds. Fruits. Leaf Fodder. Fibres and Flosses

34.27 (481) : 12.11.11 : 12.14.4–5 : 12.25–8. EICHMEYER. Erfahrungen mit der Verfütterung von Tannennadeln in Norwegen. **[Experiences with the use of Fir needles as fodder in Norway.]** *Mitt. Landwirtsch.* 58, 1943 (382). [G.] A.P.B.

In some parts of Norway Fir needles and other forest refuse have long been used for animal fodder. Recently trials were conducted by the Norwegian Agricultural High School to determine the nutritive value of these materials. Freshly collected fodders, including needles of Scots Pine, Silver Fir and Juniper, foliage and thin branches of Birch, and sawmill refuse of Aspen, Ash and Scots Pine were fed to animals. Analyses showed the dry-matter content to range from 45 to 55 per cent., of which 80–85 per cent. was carbohydrates. The protein content was small, but that of crude fats considerable, although the fats were composed largely of substances of little value. Digestibility, in terms of organic matter digested, ranged from 39–41 per cent. for Scots Pine needles to 46 per cent. for Scots Pine sawmill waste. For one fodder unit there are required, in kg.: Fir needles, 9–10; Scots Pine needles, 7; Juniper needles, 8; sawmill waste, 5–6; Birch foliage and branches, 13–14. The digestible protein content amounted to approximately 5–10 gm. per kg., except in the case of the Scots Pine mill waste, which contained no protein. The protein content was highest in the foliage and thin branches of Birch. Data on calcium, phosphorus, and carotene content were also obtained. Carotene was present in coniferous needles to the same extent as in good hay (approximately 15–28 mg. per kg.); thus the needles are of special importance in Norway in supplementing cellulose fodder. On the whole, the feeding with forest refuse proved satisfactory, especially in the case of small animals and breeding ewes.

34.27 : 12.14.7 : 12.26–8 : 12.11.11. STEYN, D. G. **Camel-thorn pods as stockfeed.** *Fmg. S. Afr.* 18, 1943 (313–8). L.S.

Tests have shown that the pods and foliage of certain species of *Acacia*, particularly *A. giraffae*, *A. lasiopetala* and *A. stolonifera*, may contain large quantities of prussic acid which under certain conditions would be dangerous to feeding stock. Mature *Acacia* pods have a high protein content (12 per cent.) and are an excellent feed. Methods by which they can be fed to animals without harmful results are indicated.

34.27 : 12.14.7 : 12.26–8. MAHENDRU, I. D. **Feeding value of ripe and dried pods of *Prosopis juliflora*.** *Punjab For. Notes* No. 8, 1943 (1–2).

The figures given below indicate that ripe and dried pods of *Prosopis juliflora* have a high nutritive value.

	Chemical composition per cent.							*Per 100 lb. of the feed*		
Name of feed	*Moisture*	*Dry matter*	*Ash*	*Fat*	*Fibre*	*Protein*	*Nitrogen free extract*	*Starch equivalent lb.*	*Digestible protein lb.*	*Nutrition period days*
1. Ripe dried pods of *Prosopis juliflora*	8·45	91·55	6·41	1·25	28·01	12·25	43·63	56·03	8·00	6·6
2. Maize grain	8·99	91·01	1·95	3·51	1·84	9·31	74·40	81·05	5·60	12·6
3. Wheat bran	8·80	91·20	5·86	2·63	10·02	13·56	59·13	43·85	10·45	3·5
4. Barley grain	8·40	91·60	3·83	1·59	6·29	8·88	71·01	64·41	6·89	8·9

34.27 : 12.26–8 (943). FRANCIS, W. D. **Edible trees and shrubs. I. The Brown Kurrajong.** *Qd. agric. J.* 57, 1943 (92). L.S.

The bark, leaves and flowers of the Brown Kurrajong (*Commersonia bartramia*) are described briefly; this species is widely distributed in the eastern coastal area of Queensland and is also found in New Guinea, the East Indies, and the Pacific Islands. It is allied to the Common Kurrajong (*Brachychiton diversifolium*) and the Bottle Tree (*B. rupestre*), which are more common in the interior of Queensland. All three species are important native fodder trees.

34.27 : 12.26–8 (54.8). KHAN, A. H. **A note on the departmental cultivation, collection and curing of cardamoms in the evergreen forests of Madras Presidency.** *Indian For.* 70, 1944 (106–14 + plate).

The method of propagation of wild cardamons in evergreen forests, and the technique of raising new plantations in suitable areas are described with figures of cost and yield. Hints on collection, curing and storage with a description and sketch of a cardamon drying kiln are given. *Author's summary.*

34.28. Bamboos

34.28 : 12.29 (86) : 12.19 : 38.1. MARRERO, J. Utilización de la cana Guadúa en Ecuador. [**Utilization of the Guayaquil cane in Ecuador.**] *Carib. For.* 5, 1944 (145–51). [Span.e.] [Tropical Forest Exp. Sta., Puerto Rico.]

The Guadúa, or Guayaquil cane, *Guadua latifolia* and *G. angustifolia*, is much larger than the common bamboo, *Bambusa vulgaris*. It is found in Peru and Colombia, and is extensively used in all the littoral provinces of Ecuador. It grows in the openings of the forests and along rivers, and quite often in clearings made for agriculture. In Ecuador its use by the native population for light construction and miscellaneous purposes is very widespread owing to its great adaptability and the ease with which it can be grown, prepared, and transported. It is thought that its cultivation should be tried under Puerto-Rican conditions. *From author's summary.*

34.3. Products of the Animal Kingdom

34.3 (73) : 91.4 : 91.7. **What can forest wildlife contribute to the war program? Report of Committee on Game Management with Reference to Forestry, Society of American Foresters.** *J. For.* 42, 1944 (361–3).

It is estimated that over 104 million lb. of meat were taken by hunters from the forested lands in the United States during 1942. The present report indicates that under proper management forest wildlife could supply much more of the war-time requirements of the country in the form of meat, fish, skins, furs, fats, and recreation than it is doing at present, and that frequently this contribution could be made to the advantage of the wildlife itself through the removal of surplus populations.

34.6. *Utilization of Logging and Milling Waste*

34.6 : 33.06. CORDES, T. K. **Fuel from wood waste.** *Wood* 9, 1944 (133–5).

Note on the manufacture of pres-to-logs, made by compressing sawdust, shavings, etc. into fuel logs. The raw material, which must not contain more than 10–12 per cent. moisture, is compressed to more than three times its original density in a machine having a capacity of 12–13 tons per day. Pres-to-logs provide a clean, long-burning fuel with a high calorific value, and can be transported with ease. They are in great demand in the U.S.A. where the process of manufacture was developed. [Cf. *For. Abstr.* 3 (68).]

34.6 (71.1) : 32.91.12. BRITISH COLUMBIA. **Report of the Forest Branch for the year ended December 31st 1943.** King's Printer, Victoria, B.C. 1944. pp. 71 + plates.

The British Columbia Forest Service, the Powell River Co., Ltd., and the Camox Logging and Railway Co., Ltd., are undertaking a co-operative investigation to determine the possibilities of the economic utilization, for the manufacture of pulp, of sound wood left behind after a normal sawlog operation in the coast forests of the Province. Methods and equipment in common use have been adapted for handling the relatively small material which forms the bulk of the logging debris. The material being salvaged has an average length of 34–35 ft. and a small-end diameter of 6 in.

During the first year of the investigation a volume of 275,680 cu. ft. was recovered on an area of 164 acres—an average of 1,665 cu. ft. per acre compared with the 6,250 cu. ft. per acre that had been taken in the original sawlog operation. In addition, material on 96 acres had been felled and cross-cut in preparation for yarding. Small test shipments have been sent to the pulp mill, and thus far the costs involved suggest that the salvage operations can be undertaken profitably. Advantages from such a development would include the extended life of the present mature timber on the coast, thus tending to stabilize logging communities and provision of off-season employment for settlers and farmers (p. BB15). [See also *B.C. Lumberm.* 28 (2) 1944 (25–6, 50 B).]

34.6. HASSELSTROM, T. **Fundamental research on tall oil and sulphate turpentine and commercial exploitation of results.** *Paper Tr. J.* 118 (16), 1944 (30–4). [G. & A. Laboratories, Inc., Savannah, Ga.] P.R.

34.6 : 33.32. HASTINGS, R. **Tall oil for the textile industry.** *Amer. Dyest. Rep.* 33, 1944 (25–6, 50). L.S.

This paper reviews briefly the source and composition of tall oil and describes some of the uses to which it may be adapted.

34.6 : 33.32. SANKEY, C. A., and ROSTEN, M. M. **Alcohol from waste sulphite liquor with special reference to the Thorold, Ont. plant of the Ontario Paper Co., Ltd.** *Pulp Paper Mag. Can.* 45, 1944 (171–8, 188).

38. FOREST CONSTRUCTIONAL WORKS. ENGINEERING

38.1 : 33.15. DIETZ, A. G. H. **Conservation of wood.** *J. Boston Soc. civ. Engrs.* 30, 1943 (187–96). [Massachusetts Institute of Technology, Cambridge Massachusetts.] P.O.

Wood has become a strategic material and must be used with care. For temporary structures and those loaded intermittently, increases in working stresses up to 25 per cent., and possibly even 33 per cent., do not affect the margin of safety appreciably. Conservation of material can also be effected by certain modern construction techniques. Of these, the use of timber connectors is outstanding. The use of glued laminated members and of plywood can also lead to marked economies. *From author's summary.*

38.1 (73). **Distribution methods and costs.** *Sth. Lumberm.* 168 (2112), 1944 (51–2).

The U.S. Federal Trade Commission's Report to Congress on the investigation of the building material industry in the United States has recently been issued. The present paper is a summary of that section of Part III of the Report that deals with distribution methods and costs for lumber.

38.1 : 33.91 : 31.27 : 33.15. UNITED STATES. **National emergency specification for the design, fabrication and erection of stress grade lumber and its fastenings for buildings.** *Directive U.S. War Prod. Bd.* (*Conserv. Div.*) No. 29, 1943. pp. 63. Build. Sci. Abstr. 17 (n.s.) 1944 (82). P.R.

This specification is intended to control the design, manufacture and erection of stress grade lumber when used in buildings. It also defines the design of fastenings used to connect such lumber. Stress grade lumber consists of beams and stringers, joists and planks, posts and timbers which have been graded for strength by a recognized lumber grading or inspection department. The allowable unit stresses for some 26 species of lumber are tabulated for various structural conditions. Design formulas and provisions for the use of stress grade lumber are presented, as well as basic design considerations and limitations for timber connector joints. A series of tables shows the allowable loads for different types of connectors—namely (1) split-ring, (2) toothed-ring, (3) claw-plate, and (4) shear-plate, together with the appropriate end distances and spacings for them. Standard bolted joints are illustrated and specified, the allowable loads on one bolt loaded at both ends being tabulated for different lumber species and bolt lengths. Provisions governing the use of lag screw, nail, spike, driftpin and wood screw joints, and for the design and construction of glued laminated structural members, are laid down. Some optional provisions and data are given in the Appendices:—A. Lateral distribution of a concentrated load. B. Formulas for wood columns with side loads and eccentricity. C. Graphical solution of Hankinson formula. D. Recommended construction practices. E. Over 40 references to timber construction.

38.1–2. **Post-war building studies. No. 1. House construction.** H.M. Stationery Office, London. 1944. pp. 152.

The use of wood in building construction is referred to in various parts of the text.

38.1–2 : 33.32. **Post-war building construction. No. 3. Plastics.** H.M. Stationery Office, London. 1944. pp. 48.

38.1–2 : 33.15 : 31.2 : 33.36.1 : 33.36.3. SJOSTROM, C. **Prefabrication in timber—a survey of existing methods. Part I.** English Joinery Manufacturers' Association, London. 1943. pp. 45. Build. Sci. Abstr. 16 (n.s.), 1943 (926). P.R.

After a brief historical survey of the prefabrication of timber houses, some of the chief physical and structural properties of timber are discussed; reference is made to the principal methods of seasoning and treating timber. The structure and functions of the various components of a timber building, i.e. walls, floors, roofs, windows, etc. are then analysed mainly from the standpoint of performance standards and of improvements in building technique. Special consideration is given to the provision of adequate thermal and sound insulation in such structures. Some of the more usual types of prefabricated timber house constructions are then fully analysed and illustrated diagrammatically under the following headings:—(*a*) Frame types, (*b*) solid structural wall types, (*c*) structural panel types.

Reference is also made to some plywood constructions involving the stressed-skin principle comprising studs with two sheets of plywood glued to both sides. Some typical stressed-skin floor and wall constructions are described and illustrated. Consideration is given to the transport of prefabricated timber sections, to their initial and maintenance costs, and to the choice of external wall finishes for prefabricated houses. Finally, the attitude of trade unions and of the public to prefabricated building in Great Britain, America and Sweden is discussed.

38.1–2 : 33.15. ZWEIG, A. **Heavy timber trusses carry timber arches.** *Engng. News-Rec.* 131, 1943 (190–3). L.S.

The structural design is outlined for an aeroplane factory in which heavy timber construction is used as a substitute for steel. One building unit made use of 40-ft. span timber trusses to support the ends of 100-ft. span laminated timber arches.

38.2. MORRISON, C. F. **Modern timber engineering.** *B.C. Lumberm.* 27 (12), 1943 (65–8, 71–2); 28 (1), 1944 (57–60). [Univ. of Toronto.]

Modern designs of joints and members are discussed.

38.2 : 31.27. **Simple timber truss designed to support girder forms.** *Engng. News-Rec.* 131, 1943 (895). L.S.

Timber trusses were used as false-work to support concrete girder forms in dam construction. It was calculated that the fresh concrete imposed a total load of 360,000 lb. on each truss, the maximum computed deflexion of the loaded truss being $\frac{3}{16}$ in.

38.2 : 31.27. KETCHUM, M. S. **Angle of load to grain for timber connectors.** *Civ. Engng., Easton, Pa.* 13, 1943 (227). L.S.

As a basis for a better understanding of the structural action of timber connectors, free body diagrams should be used to illustrate the forces involved in holding a joint together.

38.2 : 33.15. **Plywood-metal panels used in new construction technique.** *Sth. Lumberm.* 168 (2116), 1944 (55–6).

A new technique of building construction making use of factory-fabricated plywood-plastic-metal panels has been developed by the United States Plywood Corporation. The panels, which are made of plywood, plastic adhesive and light metal of paper thickness, are known as 'Armorply'. This material can be factory-fabricated to sizes required, and, in building construction, can be used for: (*a*) framework, (*b*) sheathing, and (*c*) exterior siding or roofing. A house constructed by this system has at least 50 per cent. less dead load than one built by ordinary methods.

38.2 : 34.6 : 12.25–8 : 33.36.1. **Timber reinforcement for concrete members investigated by South African Timber Control.** *B.C. Lumberm.* 27 (12), 1943 (44, 46).

Note on current investigations. The successful development of this method of construction would reduce the amount of steel used in light reinforced concrete structures. The amount of timber required for reinforcement would be much less than for an equally strong all-timber beam. Inferior varieties of timber that are unsuitable for carpentry work and

laths too small for use as beams could be used as reinforcement. So far only the timber of *Eucalyptus saligna* and *Pinus insignis* has been tested. The results were satisfactory, and it was found that it would be possible to use timber containing relatively large defects. In order to be used as a reinforcement, the timber requires special treatment to prevent the absorption of water and to provide satisfactory bond strength. From the various tests made, three different methods, each consisting of dipping seasoned timber into a special quickly-drying paint, have been found satisfactory. Recommendations for the design of timber-reinforced beams have been drawn up and are presented.

38.3. The Inter-American highway. *Engineering* 157 (4088), 1944 (381–3 + illus.).

Timber drainage structures on the Costa Rican section are described and illustrated. They are made of sawn local timber and have an expected life of 5 years.

38.3. [MITCHELL, S.] The engineering of timber highway structures. *Timb. & Plyw.* 87, 1944 (12, 16, 28, 30). [Purdue Univ., Lafayette, Indiana.] P.R.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42.2. *Temperature Influences*

42.21 : 12.25 : 12.14.5. GARDNER, V. R. **Winter hardiness in juvenile and adult forms of certain conifers.** *Bot. Gaz.* 105, 1944 (408–10). [Michigan State College, East Lansing, Mich.] O.B.D.

Striking differences in winter hardiness were observed at the Graham Horticultural Experiment Station, Michigan, between normal branches of *Juniperus chinensis* var. *variegata* and *J. horizontalis* bearing appressed, scale-like adult leaves, and reverted branches bearing typical acicular juvenile-type foliage. As a result of the moderately severe winter of 1942–43 practically all the twigs bearing adult leaves were killed, whereas the leaves and wood of the reverted juvenile branches were uninjured.

42.21 : 12.26–8 (54.2) : 11.11.2 : 23.5 : 23.21. RAYNOR, E. W. [Frost problems.] Paper (I). *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 24, 1941 (549–52).
42.21 (54.3) : 11.11.2. SAGREIYA, K. P. [Frost problems.] Paper (II). With Annexure 'A'. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 24, 1941 (553, 553–5).
42.21 (54.5) : 23.21 : 11.11.2. MOHAN, N. P. [Frost problems.] Paper (III). With report of debate. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* No. 24, 1941 (555–6, 556–9).

S. H. Howard, defining the differences between radiation frost and pool frost, emphasized the importance of purely local factors in causing so-called induced radiation and artificial pool effect, and discussed the different measures that have been taken to deal with them. E. W. Raynor's paper deals with protective methods adopted against frost in the *Shorea robusta* tracts of the Bhabar and Tarai and on the Gangetic alluvium of eastern United Provinces, describing the use made of favourable topographical features, of various degrees of shelterwood, of the marginal effect of adjoining forest, of field crops, and of relatively frost-hardy nurse trees. K. P. Sagreiya contributes a collection of notes on the mechanism of frost damage with suggestions for preventing it in the Central Provinces. N. P. Mohan discusses aspects of frost damage in the Punjab irrigated plantations.

42.5. *Chemical Influences. Nutrient Deficiencies*

42.51 : 12.25. LATTA, R., and JOHNSON, A. C. **Seasonal changes in reaction of coniferous evergreens to methyl bromide fumigations.** *J. econ. Ent.* 37, 1944 (261–3). [U.S. Bureau of Entomology and Plant Quarantine.]

Investigations carried out in Virginia, Maryland and Delaware to test the tolerance of seven species of coniferous nursery plants to methyl bromide fumigation indicated that for at least six of the seven species tested, a period of high tolerance (apparently coincident with the period of least activity of the plants) exists in midwinter and is preceded and followed by periods of lower tolerance. It was concluded that fumigation of conifers is advisable, as a rule, only where open weather conditions permit their treatment during the period of least activity.

43. FOREST FIRES

43.0. *Predisposing Factors and Causes*

43.01 (74.1) : 11.16.2. FOBES, C. B. **Lightning fires in the forests of northern Maine.** *J. For.* 42, 1944 (291–3). [Univ. of Maine.]

In the Maine Forestry District, which covers some 100,000,000 acres of forest land, the number of lightning fires averaged 18·3 fires per year for the 15-year period 1926–40, or 15 per cent. of the total number of fires from all causes. The average annual area burned by lightning fires was 668·7 acres, or 4·7 per cent. of the total area burned.

43.1. *Protective Measures*

43.11. JEMISON, G. M. **Forest fire danger indexes.** *J. For.* 42, 1944 (261–3).

A number of systems for rating or classifying forest-fire danger have been developed in the United States in recent years. Different types of ratings are based on different measurable factors such as fuel type and condition, weather, visibility, available labour, etc., and their most effective use depends on an understanding by the administration officer of these factors and the relations between the various types of ratings. In the present paper the five principal types in use in the United States—the basic burning index, preparedness index, rate-of-spread index, dispatchers' or manpower index, and fire-line index—are classified on this basis.

43.11 : 12.19.3 (66.9) : 34.21 : 11.62.11. STEWART, J. L. **Grass burning in West Africa.** *Farm and Forest* 5, 1944 (13–4).

While opposed in principle to the practice of grass burning, the author believes that early burning of long 'bush' is not only permissible, but even advisable, in the less thickly populated parts of West Africa, provided

that there is also a continued endeavour to increase the extent of unburned areas. Complete protection has had particularly good results in one area in the Northern Territories of the Gold Coast where grass-burning is forbidden by the Native Administrations; it prevents erosion and makes available a certain amount of dry-season grazing for livestock.

While it is considered inadvisable to prohibit burning in large areas where complete protection is virtually impossible, it is suggested that, in view of the importance of non-burning in erosion control, the population should be educated to the idea of fire prevention in specified areas.

43.11 (68.9). CLEMENTS, J. B. **District fire boards.** *Farm and Forest* 5, 1944 (5–7).

The enactment in 1925 of a 'Grass Fires Prevention Ordinance' applying to southern Nyasaland met with a disappointing response, but in 1926 a village forest area scheme, which stipulated early burning as the first step in forest management, received a reasonable amount of support from the village headmen concerned. A Bush Fires Committee was appointed in 1931 'to enquire into and report generally on the results of the policy adopted hitherto in Nyasaland regarding bush fires and to submit recommendations as to whether existing legislation should be cancelled, retained or amended, and as to any other steps which could usefully be taken to reduce any damage that may have been caused by bush fires'. The recommendations of this Committee, after considerable official and public discussion, were accepted with little modification, and resulted in the enactment of the 'Bush Fires Ordinance' of 1932. This ordinance made provision for the appointment of Fire Boards in districts of the Protectorate to which it applied, and the Governor-in-Council was given the power to prohibit, except under permit, 'the burning of any growing or standing trees, shrubs, bush, brushwood, undergrowth or grass on all or any land during any season of the year specified by such order'.

Stress was laid on the need to educate local opinion to an appreciation of the necessity for controlling fires and reducing their intensity. Complete suppression of the practice of firing was not recommended since damage tends to be much more severe when fire breaks out in protected areas than in those subjected to mild annual burning.

The Fire Boards themselves are only consultative or advisory, but the Native Authorities which are merged into them exercise the functions of local government. The practice of controlled early burning is generally recommended, but details vary according to the climate and vegetation of a region and other local factors. In the greater part of Nyasaland firing now takes place much earlier in the dry season than was customary before 1932 and the policy of the Government has the support of most of the Native Authorities.

43.12. BRUCE, H. D. **Observations on the visibility of a small smoke.** With comment by A. A. Brown. *J. For.* 42, 1944 (426–34).

Results of observations made under a variety of atmospheric conditions for three typical California backgrounds emphasize the important influence of haze on smoke visibility, and indicate the need for accurate haze measurements in planning and managing a fire-detection system. It was found that haze concentration may vary widely over a single region.

For a given haze concentration, smoke visibility against uniform backgrounds appears to vary directly with the angle of illumination of the sun, a fact of particular importance with reference to light backgrounds, northerly latitudes and the early and late hours of the day.

As the sun changes its position with time of day, smoke visibility also changes, producing what might be called an azimuth-visibility pattern about the lookout. Data show this pattern to be sufficiently distorted from a true circle to be of importance in locating lookout detection stations, particularly when considered in relation to the time of start of fires and the distribution of fire-occurrence zones in the locality.

It is concluded that because of the great importance of type of background, lookouts should be stationed much closer together in country where mottled or light-coloured backgrounds are more common than where the cover is uniformly dark brush or Pine forest.

43.13 : 07.7. ORELL, B. L. **Fighting fire with fog.** *J. For.* 42, 1944 (423–5).

A fire-fighting pump that produces a fine spray or mist, closely approximating the atomization factor of low-pressure steam, has been used with much success in controlling fires on a range area in western Oregon. The unit has a self-contained motor and a built-in 200-gal. tank, and operates at pressures of 500 to 800 lb./sq. in. It can be operated by one man but more efficiently by a two-man crew.

Breaking the water into a fine spray greatly increases its ability to absorb heat; this permits the fire-fighter to get much nearer a hot fire than is ordinarily possible, thus increasing the efficiency and endurance of the crew. The unit is particularly effective in dealing with fires in light fuels and as a quick-action unit for small fires just getting under way; there are certain limitations, particularly as regards mobility, in its use against fires burning in heavy fuels.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.1. *Forest Weeds*

44.1 : 12.26–8. CEYLON. **Silvicultural research administration 1942.** [Ceylon Forest Department.] 1943. pp. 8.

Of the cover crops used in attempts to eradicate *Mikania scandens* from Jak (*Artocarpus integra*) plantations, *Flemingia strobilifera* gave the best results and *Glyricida maculata* was satisfactory if cut back to induce branching and increase shade (p. 6).

44.1 : 12.26–8 : 13.2. GARDNER, J. C. M. **A note on the imported lantana bug (*Teleonemia scrupulosa* Stal.).** *Indian For.* 70, 1944 (139–40). [Forest Research Institute, Dehra Dun.]

Investigations on the Lantana bug (*Teleonemia scrupulosa*) were carried out at Dehra Dun in order to determine its reactions to the local climate, its effect on Lantana, and, above all, on other Verbenaceae, such as Teak, which are of economic importance. The bug definitely preferred Lantana, especially the flowers, to any other plant offered; but once the Lantana had been defoliated the bugs migrated to Teak leaves, where they were able to feed and reproduce rather less rapidly. The effect on Teak flowers has not been assessed, but it seems likely that the bugs would constitute a serious risk to seed production of this species if released in large

numbers in a Lantana-infested area from which they might spread to this host.

44.3. *Fungi*

44.3 : 23.23.19. SORAUER, P. Handbuch der Pflanzenkrankheiten. Sechster Band: Pflanzenschutz. Verhütung und Bekämpfung der Pflanzenkrankheiten. Zweiter Halbband. [**Handbook of plant diseases. Volume 6: Plant protection. Prevention and control of plant diseases. Second half-volume.**] Verlagsbuchhandlung Paul Parey, Berlin. 1941. pp. viii + 732. [G.]

This large book is the second half-volume of the latest edition of the sixth volume of the well-known Handbuch of which Paul Sorauer was the original author. Dr. Appel is the editor of the present part, a number of specialists being responsible for the different sections. The first half-volume is, unfortunately, not to hand for review. The present book, however, deals with a number of independent topics and may be read for itself satisfactorily in the absence of the first part. The ground covered is very extensive, the general subjects being: the biological control of pests; the technical means of plant protection (steeping, spraying and dusting); the testing and evaluation of seed (including potatoes); the development and propagation of disease resistant varieties; the laws, principally of Germany, but also of other countries in brief, for the control and prevention of plant disease; the organization of plant protection services, principally in Germany, but also in other countries; and, finally, a considerable bibliography is given of literature concerned with plant protection. There is a satisfactory table of contents and what appears to be a very efficient index.

This book is pre-eminently a work of reference and one which institutions concerned with the control of plant disease will desire to possess. It will be of less service to foreign than to German readers; this is especially true of those parts concerned with the description of technical apparatus. Nevertheless it contains much useful and well set-out matter and maintains the standard which is generally associated with this work. W. R. D.

44.3 : 12.25 (79.7) : 12.21. ENGLERTH, G. H., and ISAAC, L. A. **Decay of Western Hemlock following logging injury.** *Timberman* 45 (8), 1943–44 (34–5, 56).

A study was undertaken to determine the extent of decay resulting from logging injuries in a residual stand of Western Hemlock (*Tsuga heterophylla*). The original stand consisted of overmature old-growth Douglas Fir with some Hemlock, Cedar and White Pine and an understorey of Hemlock of all sizes; this had been logged twelve years previous to the investigation when all merchantable material was removed. Over half of the residual trees had been injured in the logging operation, and decay had entered the wounds of nearly all trees examined. The decay had spread an average distance of 2·4 ft. and a maximum of 8 ft. vertically beyond the wound scar, and had penetrated to an average depth of 4·8 in. and a maximum depth of 12 in. The fungi entering through basal wounds were *Fomes annosus*, *Poria colorea* and *P. subacida*, the first-named being most common; trunk wounds were usually infected with *Fomes pinicola*, and *F. applanatus* was found once associated with a broken top.

44.3 : 12.25 : 12.21. HIRT, R. R. **Needle rust: a common disease of Red Pine.** New York State College of Forestry, Syracuse, N.Y. [n.d.] pp. 4.

Appreciable damage to Red Pines (*Pinus resinosa*) by the needle rust (*Coleosporium solidaginis*) is usually restricted to small trees of which all needles except those of the current season may be badly damaged, resulting in a reduction in height growth. The alternate host of the rust is the goldenrod (*Solidago* sp.) and destruction of this plant in the vicinity of Red Pine plantations is advised as a control measure.

44.3 : 12.25 : 12.26–8 : 12.21. WEBER, G. F. **A rust of Florida Pines caused by *Cronartium quercuum* (Berk.) Miya.** *Proc. Fla. Acad. Sci. 1940* 5, 1941 (262–9). [Univ. of Florida.] L.S.

The Yellow Pine blister rust, *Cronartium quercuum*, causes galls on several species of Florida Pines (especially *Pinus taeda*); a wide range of Oaks act as the alternate hosts for this fungus. Pines cannot be re-infected by spores produced on the same species; thus the removal of all Oaks within a half-mile radius of infected trees will prevent the spread of the disease. One form of the uredospores produced on Oak can, however, re-infect the same host and so may produce a closed cycle of infection on *Quercus* spp. The disease is important not only in forest stands but also in tree nurseries where it may cause serious losses.

Control of Yellow Pine blister rust in Florida is difficult owing to the wide distribution of the alternate hosts. Infection in forest stands may be reduced to a minimum by annual removal of the galls, while in nurseries the properly-timed application of fungicides may give effective control.

44.3 : 12.25 : 12.21. MARTIN, J. F. ***Ribes* eradication effectively controls White Pine blister rust.** *J. For.* 42, 1944 (255–60). [U.S. Bureau of Entomology and Plant Quarantine.]

In White Pine (*Pinus strobus*) forest areas the blister rust (*Cronartium ribicola*) can be effectively controlled by reducing the *Ribes* to an average of 25 ft. of live stem or less per acre and subsequently keeping these plants suppressed. Complete eradication of *Ribes* can be justified only in certain areas, e.g. Pine stands of aesthetic or recreational importance, or forest-tree nurseries.

44.3 : 12.25 : 12.21. SLAGG, C. M. ***Phomopsis* blight of grafted Cedars.** *Amer. Nurserym.* 79 (8), 1944 (9).

Recommendations are made for the prevention, as far as possible, of Cedar blight (*Phomopsis juniperovora*) on grafted varieties of the Rocky Mountain Juniper (*Juniperus scopulorum*). The disease is believed to have spread from infected seedlings used as rootstocks.

44.3 (46) : 12.25 : 12.26–8 : 12.21 : 31.42.1. MARTINEZ, J. B. La investigacion de las alteraciones micologicas de la madera. [**The investigation of mycological changes in wood.**] Consejo Superior de Investigaciones Cientificas, Madrid. 1943. pp. xi + 116 + plates. [Span.f.e.g.]

The study of mycological changes in wood has so far received little attention in Spain. The present publication is the first of a series presenting the results of investigations undertaken by the author, and deals with the principal types of wood discoloration observed in Spain. Descriptions are given of the diseases involved and of control methods.

Blue rot on *Pinus sylvestris* was found to be caused by *Ceratostomella pini* Münch in standing timber at Guadarrama, Madrid, and by *C. piceae* Münch, *C.*

caerulea Münch, and *Endoconidiophora caerulescens* Münch in felled timber at Balsain, Segovia.

In the Irati forest, Navarra, green rot in Beech was caused by *Chlorosplenium aeruginosum* De Not. Investigations on red heart in Beech on material collected in the same forest led to the identification of the following disease agents: *Ungulina* (*Fomes*) *marginata* Pat., *Ganoderma applanatum* Pat., *Coriolus* (*Fomes*) *connatus* Quel., and *Hypoxylon coccineum* Bull. The first-named fungus was isolated by the author.

Twenty-one fungi are considered as probable agents of stem rot (dozed wood) of Beech in Spain; of these the 12 most frequently encountered were: *Hypoxylon coccineum* Bull., *Bispora monilioides* Corda, *Ustulina maxima* Wettstein, *Diatrype disciformis* Fries., *Eutypa flavovirescens* Sacc., *Schizophyllum commune* Fries., *Panus rudis* Fries., *Stereum fasciatum* Schweinitz [= *S. insignitum* Quelet), *Coriolus pergamenus* Patouillard, *Ungulina* (*Fomes*) *fomentaria* Pat., *U. marginata* Pat., and *Ganoderma applanatum* Pat. The first-named fungus, which is doubtless the principal agent of the disease in the Irati forest, was isolated by the author.

44.3 : 12.26–8 : 12.21. WILKINS, W. H. **Studies in the genus *Ustulina* with special reference to parasitism. VI. A brief account of heart rot of Beech (*Fagus sylvatica* L.) caused by *Ustulina*.** *Trans. Brit. mycol. Soc.* 26, 1943 (169–70 + plate). [Univ. Department of Botany, Oxford.] I.M.I.

Isolations from the decayed timber of a 170-year-old Beech tree felled in the Botanic Gardens, Oxford, showed that the greater part of the wood was diseased by *Ustulina*, a fungus which has previously been shown to cause a heart rot of Lime and Elm. The major symptoms of decay are outlined.

44.3 (74.9) : 12.26–8 : 12.21. REX, E. G., and MAY, C. **Natural spread of Dutch Elm [disease] in a small area in New Jersey.** *Arborist's News* 8 (12), 1943 (89–90). E.S.R. 90 (654).

A stand of Elms in good condition, in which only a few trees were infected and where natural spread could take place, was selected for detailed record as one step in obtaining needed information on the progress of the disease (caused by *Ceratostomella ulmi*) and eventual losses involved, as a basis for planning future control measures.

44.3 : 12.26–8 : 12.21. FELT, E. P. **The Dutch Elm disease problem.** *Parks & Recreation* 27 (1), 1944 (16–8). E.S.R. 90 (789).

The present status of the disease (caused by *Ceratostomella ulmi*) and its control are discussed. Experience of more than a decade has shown that it does not spread and kill trees as rapidly as was at first supposed. However, a large increase in the number of Elms attractive to bark beetles because of injury was followed in New Jersey in 1938 by a threefold increase in diseased Elms. Tremendous increases may thus be expected in any infected area where there is not systematic control by the early removal and destruction of weak and dead Elms.

44.3 : 12.26–8 : 12.21. ARK, P. A. **Pollen as a source of Walnut bacterial blight infection.** *Phytopathology* 34, 1944 (330–4). [Univ. of California, Berkeley, Calif.]

Experiments are described which demonstrate the fact that pollen from infected catkins is capable, under favourable environmental conditions, of transmitting blight organism (*Phytomonas juglandis*) to healthy pistillate flowers and to uninfected Walnut leaves. The importance of this source of contamination is obvious when the large amount of pollen produced by the catkins of a single tree is taken into account. Since the catkins are susceptible to infection all the year round, they are capable of playing a major rôle in the overwintering and dissemination of the Walnut blight organism.

44.3 : 12.26–8 : 12.21. **Oak wilt found fatal.** *Amer. Nurserym.* 79 (9), 1944 (23).

Oak wilt has been responsible in recent years for the death of many trees of Red, Black, White and Bur Oak in Wisconsin and other parts of the upper Mississippi valley. Some White Oaks have been able to withstand the disease for several years, but there are no authentic cases of the recovery of Red or Black Oak. The disease is caused by a hitherto unknown fungus which lives in the water-conducting tissues of the tree, and so far no means of control have been found.

44.3 : 12.26–8 : 12.21. MUJICA, R. F. Patogenicidad de algunas cepas del *Verticillium albo-atrum* Rei. y Berth. [**Pathogenicity of some strains of *V. albo-atrum*.**] *Bol. Sanid. Veg., Chile* 1 (2), 1941 (7–20). E.S.R. 89 (688–9).

The 10 strains studied were classified into 3 groups according to their pathogenicity to potato plants and their vigour of growth in pure culture. Weakly pathogenic strains were obtained from *Acer platanoides* and *Ulmus americana*, while strains from *Acer pennsylvanicum* and *Platanus* sp. proved to be nonpathogenic to potato.

45. DAMAGE BY ANIMALS

45.3. *Insects*

45.3. **Bibliography on insect pest resistance in plants (with a supplement on resistance to nematodes).** Imperial Bureau of Plant Breeding and Genetics, Cambridge. 1944. pp. 39.

References to insect pest resistance in certain forest tree species are included.

45.3 : 13.2 : 12.21. FAWCETT, H. S. **Fungus and bacterial diseases of insects as factors in biological control.** *Bot. Rev.* 10, 1944 (327–48). [Univ. of California Citrus Exp. Sta., Riverside.]

45.3 : 13.2. NICOL, H. **Biological control of insects.** Pelican Books Series. Penguin Books, Harmondsworth, Middlesex, England, and 300 Fourth Avenue, New York, U.S.A. 1943. pp. 174 + plates.

45.3 : 44.3 : 01.4. GLASGOW, R. D., and BLAIR, R. **The use of explosives for the application of insecticide dusts.** *J. econ. Ent.* 37, 1944 (230–4). [New York State Museum, Albany.]

After a brief review of the more usual methods of applying insecticide dusts, the authors discuss the possibility of using explosives in the application of insecticides and fungicides in forest areas. Experiments with mortars of several types and dimensions showed that, with suitably balanced charges, it should be possible to secure almost any lift and dispersion of dusts that could be desired. With the preferred mortar design, excellent coverage was obtained up to a distance of at least 100 ft. from the mortar, and there was good coverage up to more than 200 yds. when wind conditions were favourable.

The method shows promise of giving effective pest control at a very moderate cost. Its possible use against malaria-bearing mosquitoes (*Anopheles* spp.) is indicated.

45.3 (729.5) : 13.2. MARTORELL-DAVILA, L. F. **A survey of the forest insects of Puerto Rico.** *Ohio State Univ., Abstr. Doctoral Diss.* No. 42, 1943 (75–80). E.S.R. 90 (663).

This survey is the result of 8 years' study and observation of the insect pests of the forest, shade, and ornamental trees of the island.

45.3 : 13.2 (931) : 31.43. HARROW, K. M. **Preliminary notes on the treatment of Australian subterranean termites in New Zealand.** *N.Z. J. Sci. Technol.* 24, 1942 (47B–52B). L.S.

The species of *Coptotermes* that have become established in New Zealand are *C. acinaciformis, C. lacteus,* and *C. frenchi.* The method of property inspection for termites and the poison-dust treatment used for control are described briefly, and results are given of laboratory and field tests with the poison dusts used. From experience in New Zealand it is concluded that once a colony is discovered it can easily be eradicated by blowing white arsenic or Paris Green dusts into the runways.

45.3 : 13.2. GÄBLER, H. Nachwirkungen einer Detalbestäubung auf überlebende Nonnen. [**After-effects of dusting with Detal on surviving nun moths.**] *Forstwiss. Cbl., Thar. forstl. Jb.* (*Kriegsgemeinschaftsausgabe.*] No. 4, 1943 (136–40). [G.] [Forschungsstelle für Nonnenbekämpfung der Sächs. Forstl. Versuchsanstalt Tharandt.]

According to the writer's observations, nun moths that survive dusting with Detal are considerably weakened; this is indicated by reduced egg production.

45.3 : 12.25 : 13.2. FURNESS, T. **Pine weevil in a young plantation.** *Quart. J. For.* 38, 1944 (31–2).

An outbreak of *Hylobius abietis* in a 7-acre plantation of Larch and Scots Pine was prevented from spreading to other parts of a 64-acre conifer plantation in South Staffordshire by the regular use of baits and traps and by occasional handpicking of the weevils.

45.3 : 12.25 : 13.2. CONNECTICUT. **Agricultural Experiment Station. Annual report for the year ending October 31, 1942.** *Bull. Conn. agric. Exp. Sta.* No. 468, 1943 (57–95). I.I.E.

Investigations on the recovery of White Pine (*Pinus strobus*) from weevil (*Pissodes strobi*) injury indicated that the degree of recovery may be closely related to the time of pruning after the injury, but additional evidence is required on this point.

45.3 : 12.25 (79.1) : 13.2 : 13.15. MCKENZIE, H. L. **The seasonal history of *Matsucoccus vexillorum* Morrison (Homoptera: Coccoidea: Margarodidae).** *Microentomology* 8 (2), 1943 (42–7). R.A.E. 32A (150–1).

In Arizona, *Matsucoccus vexillorum* Morrison was found to be responsible for the killing of branches of *Pinus ponderosa* var. *scopulorum.* A study of histological preparations of the plant tissues indicated that the Coccids obtain their food from cortical storage cells; when they feed in groups, a necrosis of the plant cells is produced, accompanied by an internal breakdown of the cell contents and the disintegration of the cell walls. *M. vexillorum* is rather generally distributed throughout the range of *P. ponderosa scopulorum* in the forested areas of Arizona and New Mexico and has not yet been found on any other food plant or outside this region.

Other species of *Matsucoccus* known to be injurious to species of *Pinus* are *M. acalyptus, M. gallicolus, M. paucicicatrices, M. fasciculensis, M. bisetosus,* and *M. californicus.*

45.3 : 12.25 : 13.2. SCHAFFNER, J. V., and MCINTYRE, H. L. **The Pine root-collar weevil.** *J. For.* 42, 1944 (269–75). [U.S. Bureau of Entomology and Plant Quarantine, New Haven, Conn.]

The Pine root-collar weevil (*Hylobius radicis*), first reported as a native insect in the United States in 1926, is now known to occur from New England south to Virginia and west into Minnesota, and is a serious pest of the exotic Scots, Austrian and Corsican Pines in New England and New York. It is not a pest in areas of natural reproduction of native species.

This paper gives an account of the characteristics, life history, habits, economic importance and control of the insect. The principal injury is caused by the larvae which concentrate in the cambial region of the root collar, while the adults feed on the bark of lateral and terminal twigs. Where direct control is economically justified best results have been obtained with an emulsion containing 25 per cent. of ethylene dichloride and 5 per cent. of dichloroethyl ether, or one containing 25 per cent. of ethylene dichloride, with dinitro-*o*-cyclohexyl phenol (100 per cent.) added at the rate of 0·5 oz. per gal. of the emulsion.

45.3 : 12.25 : 13.2. Zur Schädigung der Weisstanne durch Trieb- und Rindenläuse (*Dreyfusia*). [**Damage to Silver Fir by *Dreyfusia* spp.**]. *Schweiz. Z. Forstw.* 95, 1944 (1–11 + plates). [G.] [Entomologisches Institut der Eidg. Technischen Hochschule in Zurich.]

A general article on *D. nüsslini* and *D. piceae,* with special reference to Switzerland. The biology of *Dreyfusia* is outlined. Major damage due to *D. nüsslini* first occurred in Switzerland in 1913, and soon this insect proved much more dangerous to Swiss Silver Fir stands than *D. piceae,* which had attacked them for many years previously. Despite prolonged research the present distribution in Switzerland of *D. nüsslini* is insufficiently known. A major cause of the occurrence of new centres of infestation that are remote from existing ones would seem to be the transport of the insect with planting stock. Recently, the virulence of *D. nüsslini* appears to have increased considerably. Control most frequently consists of felling young infested trees; chemical control methods are being investigated. In the summer of 1943 there was a surprising increase in populations of *D. piceae,* and it now appears desirable to pay more attention to this species than has been done hitherto.

45.3 (43.7) : 12.25 : 13.2. NÄGELI, W. Der Lärchenblasenfuss (*Taeniothrips laricivorous* Krat.), ein 'neuer' Feind der Lärche. [***Taeniothrips laricivorous* Krat., a 'new' enemy of Larch.**] *Schweiz. Z. Forstw.* 95, 1944 (175–80 + plates). [G.]

In the past 15 years or so studies have been made of this insect in various regions of Czechoslovakia, where it has damaged young stands of Larch. It causes dieback of the leader and adjoining shoots, and when the process is repeated for several years the crown assumes a scrubby character; this may lead to loss of increment and result in Larch trees that grow in mixture being over-topped by normally slower-growing species. The damage is described for the benefit of Swiss foresters, as the insect has recently been reported in several localities of Switzerland.

45.3 (71.3) : 12.25 : 13.2. [DE GRYSE, J. J.] **Spruce budworm threatens Ontario forests.** *Pulp Paper Mag. Can.* 45, 1944 (542, 544).

A brief account is given of the life history and feeding habits of the Spruce budworm (*Cacoecia fumiferana*) which has seriously infected 3,000 sq. miles of Spruce and Balsam Fir (*Abies balsamea*) forest in Ontario. Management practices advocated for the prevention of budworm attack are: (1) The removal of mature and overmature Balsam Fir stands; (2) the utilization of younger and more vigorous Balsam stands; (3) the encouragement of regeneration of the better tree species, particularly Spruce.

45.3 : 12.25–8 (54) : 13.2. GARDNER, J. C. M. **Young trees and *Phassus* borers (Lep. Hepialidae).** *Indian For.* 70, 1944 (103–5 + plate).

A description is given of the habits of various members of the Hepialidae briefly referred to as *Phassus* borers but including insects of the genera *Endoclita*, *Sahyadrassus* and *Palpifer*. A great many species of Indian woody plants are susceptible to attack, but *Cryptomeria japonica* is thought to be the only conifer so far recorded as a host.

Since the *Phassus* larva retreats into its tunnel when disturbed, and since each tunnel is normally provided with only one exit, it is possible to kill off the attacking larvae by fumigation or contact poison. The simplest and most efficient of many methods tried was the insertion into the hole of a blob of tar on a twig; this method is not difficult to apply since infestation is never above 8 ft. from ground level.

At Darjeeling small-scale experiments with tar-blobs were 100 per cent. successful, but large-scale tests in Kannoth, Nilambur and Dhoni gave only 84, 89 and 64 per cent. kills, respectively. The treatment will not prevent re-infestation but it provides a desirable check on the spread of the insects.

45.3 (74) : 12.25–8 : 13.2 : 23.27. FELT, E. P., and BROMLEY, S. W. **The insect menace to shade trees in the northeast.** *J. econ. Ent.* 37, 1944 (212–3). [Bartlett Tree Research Laboratories, Stamford, Conn.]

The authors discuss the insect pests of Elm, Oak, and other shade trees in the northeastern United States. Among the pests of Elm are the Elm leaf beetle (*Galerucella xanthomelaena* Schrank), the cankerworms, *Paleacrita vernata* Peck and *Alsophila pometaria* Harris, and the European Elm bark beetle (*Scolytus multistriatus* Marsh.) which is an important vector of the Dutch Elm disease fungus, *Ceratostomella ulmi*.

Oak has suffered repeated defoliation by the two cankerworms, as well as damage by the forest tent caterpillar (*Malacosoma disstria* Hubn.), the gypsy moth caterpillar (*Porthetria dispar* L.) and the two-lined Chestnut borer (*Agrilus bilineatus* Web.). Low temperatures and drought have produced conditions favourable for the invasion of borers such as *Agrilus bilineatus* in Oak, *Agrilus anxius* Gory in ornamental European Birch, and *Melanophila fulvoguttata* Harris in Hemlock.

The extensive constructional work of recent years has resulted in the severe injury or death of many trees owing to injudicious drainage, flooding or filling. In one district Pitch Pine suffered injury through attack by the turpentine beetles, *Dendroctonus terebrans* Oliv. and *D. valens* Lec. which were attracted to the site by the paint on nearby structures.

45.3 (71.4) : 12.25–8 : 13.2. GOBEIL, A. R. **Forest entomology. Fifth annual report for the year ending March the 31st, 1942.** Extract from the report of the Department of Lands and Forests of the Province of Quebec. *Contr. Dep. Lands For. Quebec*, No. 18, 1943, pp. 15.

During 1941 the European Spruce sawfly (*Diprion polytomum*) continued to be the most important forest insect. It became more evenly distributed in the Province, the only regions still unaffected being the northern parts of the Gatineau and north of Montreal, but damage was generally less than in 1939 and 1940. An un-named micro-organic disease acted as an important control factor, and parasites (especially *Microplectron*) and low temperatures contributed towards the destruction of the sawfly.

In the western part of the Province the Spruce budworm (*Cacoecia fumiferana*) caused greater damage to Balsam, Spruce and Pine than did any other insect. Owing to the wide area of infestation it is considered useless to attempt to protect the trees with insecticides, and the main hope of control lies in the action of parasites.

Other insects of some importance recorded in the Province were the Larch sawfly (*Pristiphora erichsonii*), the yellow-headed Spruce sawfly (*Pikonema alaskensis*), the Spruce gall aphid (*Adelges abietis*), the Leconte's sawfly (*Neodiprion lecontei*), the Swaine's sawfly (*N. swainei*), the Birch leaf miner (*Phyllotoma nemorata*) and the green-striped Maple worm (*Anisota rubicunda*).

A study was begun on bark beetles and wood borers (mainly *Monochamus* sp. and *Dendroctonus piceaperda*) in two of their principal habitats—cut-over and burnt-over areas. The main object of the work in the former habitat was to determine the influence of three types of slash treatment on the insect fauna. No notable influence due to the treatment applied could be recorded for the first year.

In the burnt areas the aim was to determine the reason for the rapid development of long-horned borers in some burnt-over areas and not in others; three contrasting sites were selected for study. *Monochamus scutellatus* was the insect responsible for most of the damage, Jack Pine and Spruce being the species most commonly affected.

45.3 : 34.25 : 12.26–8. LAFORGE, F. B., and HALLER. H. L. J. (to the Secretary of Agriculture of the U.S.A.), **Insecticides suitable for use on plants, trees or animals.** *U.S. Patent* No. 2,328,726, Sept. 7, 1943. Chem. Abstr. 38 (1068–9). P.R.

An extract of the bark, root, fruit or leaves of Prickly Ash (*Zanthoxylum clava-herculis* L.) is used, e.g. with various diluent powders or liquids.

45.3 : 12.26–8 : 13.2. THORNE, G. ***Cacopaurus pestis*, nov. gen., nov. spec. (Nematoda: Criconematinae), a destructive parasite of the Walnut, *Juglans regia*, Linn.** *Proc. helminth. Soc. Wash.* 10, 1943 (78–83). L.S.

45.3 (78 : 79) : 12.26–8 : 13.2. SMITH, R. H. **Insects and mites injurious to Sycamore trees (*Platanus* spp.) in western North America.** *Arborist's News* 9 (2), 1944 (9–15). [Univ. of California.] E.S.R. 90 (811).

Seven species of spider mites and one Eriophyid mite have been observed to injure the foliage, and three species of Diaspid scale insects are fairly common on Sycamore trees in the western States. Only one species of aphid—***Drepanosiphum platanoides*** (Schrank)

—is of any consequence in this region, but leaf hoppers are important pests, and tree hoppers sometimes cause much injury by egg punctures in the smaller branches. Several species of bugs (Hemiptera) attack the leaves but only the Sycamore Tingids or lacebugs are important. Caterpillars of several species of butterflies are casual pests in the west; a few species of moths, however, are destructive. These pests and their control are briefly discussed.

45.3 : 12.26–8 : 13.2. MUMENTHALER, E. Das Ulmensterben in Bern. [The death of Elms in Berne.] *Schweiz. Z. Forstw.* 95, 1944 (50–2). [G.]

Recently many fine roadside Elms in Berne had to be felled following a heavy attack by *Graphium ulmi* and *Scolytus scolytus*.

45.3 : 12.26–8 (64) : 13.2. MIMEUR, J. M. Présence au Maroc de *Gossyparia ulmi* Linn. 1767 (Hémiptère Coccidae). [The presence in Morocco of *Gossyparia ulmi* Linn. 1767 (Hemiptera, Coccidae).] *Bull. Soc. Sci. nat. Maroc* 22, 1943 (137–8). R.A.E. 32A (232).

Large colonies of *Gossyparia spuria* Mod. (*ulmi*, auct.), which had not previously been recorded from Morocco, were found in August and September on Elms (*Ulmus campestris*) planted a few years before in the Middle Atlas Mountains, at an altitude of about 5,250 ft. The colonies consisted chiefly of adult females and occurred mainly on young twigs. The Coccid was not observed on old trees and was probably introduced on the trees on which it was found.

45.3 (74) : 12.26–8 : 13.2. BROWN, R. C., and SHEALS, R. A. The present outlook on the gypsy moth problem. *J. For.* 42, 1944 (393–407). [Bureau of Entomology and Plant Quarantine, Greenfield, Mass.]

An account of the history of gypsy-moth (*Porthetria dispar*) infestations in the New England States and of developments in the control of this insect to date, with reference to plans for future work on this project. Subjects dealt with include: the effect of forest composition and physical factors on gypsy moth abundance; silvicultural control; the effectiveness of parasites, predators and disease; losses resulting from defoliation; the effectiveness of, and methods of distributing, insecticides; methods for locating infestations; changes in control methods and procedure now in effect or contemplated.

45.3 : 12.26–8 : 13.2. LANGE, W. H. An alternate host record for the aphid, *Thecabius populi-monilis* (Riley). *Pan-Pacific Ent.* 19, 1943 (133). I.I.E.

In October, 1942, the author found apterous forms of *Thecabius populi-monilis* on the roots of Willow (*Salix* sp.) on the banks of the Arroyo Seco River in Monterey County, California. This is believed to be the first record of the species on the roots of any plant. It frequently forms bead-like pseudogalls on the upper side of the leaves of *Populus* spp. in central and southern California.

45.3 : 12.26–8 : 13.2. CARTER, W. The use of D-D mixture against *Anomala* and *Adoretus* infesting nursery stock. *J. econ. Ent.* 37, 1944 (117–8). [Pineapple Research Institute, Honolulu, Hawaii.]

In small-scale tests to determine the efficacy of a mixture of 1–3 Dichloropropylene and 1–2 Dichloropropane against ground beetle larvae on several actively growing plants, including *Cassia* spp. and *Cinchona ledgeriana*, it was shown that a saturated water solution of the mixture diluted with an equal quantity of water caused no injury to nursery stock and gave a 100 per cent. kill of the infesting larvae. Dilutions greater than 1 in 4 failed to kill all the larvae, while the use of undiluted water solution or an emulsion of crude D-D mixture resulted in serious injury to the plants.

45.3 : 12.26–8 (729.4) : 13.2 : 34.26. KNIGHT, P. Insects associated with the Palay rubber vine in Haiti. *J. econ. Ent.* 37, 1944 (100–2).

Among the insect pests of *Cryptostegia grandiflora* recorded in the Republic of Haiti are the cotton aphid (*Aphis gossypii*), the hemispherical scale (*Saissetia hemispherica*), the fire ant (*Solenopsis geminata* and *Dorymyrmex pyramicus* var. *niger*), various Curculionidae (*Larchnocarpus*, *Artipus*, and *Exophthalmus*) and the milkweed bug (*Oncopeltus aulicus*).

The cotton aphid was the most significant insect pest during the period of investigation (February 10 to April 14, 1943) but *Saissetia hemispherica* appeared to be potentially a more serious menace. Although *Aphis gossypii* was parasitized on cotton and certain other plants by *Lysephlebus testaceipes*, at no time were parasitized aphids found on *Cryptostegia*. Several species of ants associated with *Saissetia hemispherica* on scale-infested vines caused damage to the pollination mechanism and seriously interfered with the latex harvest. The chewing insects (Curculionidae) appeared first in great numbers after the break of the dry season and caused considerable feeding injury to leaves, buds, and tender shoots. Also coincident with the wet season was a decided increase in the number of adults of *Oncopeltus aulicus*.

Pollination of *Cryptostegia* is apparently effected by a very limited number of insect species which are small enough to enter the corolla of the blossom and at the same time possess probosces of sufficient length to reach the translators.

46. DAMAGE BY MAN

46 : 12.25. HESS, E. Zerstörung der Arvenverjüngung durch Beerensammeln. [Destruction of Cembran Pine reproduction through berry-picking.] *Schweiz. Z. Forstw.* 94, 1943 (58–61). [G.]

Bilberries may be harvested by plucking the berries by hand, by removing whole branches, or by using a comb-like instrument known as a 'Beeristrähl' or 'Heitisträhl'. All three methods result in damage to Pine (*Pinus cembra*) reproduction, and the author believes that the complete prohibition of berry-picking is the only means of ensuring satisfactory reproduction of Cembran Pine.

46 : 23.27. THOMPSON, A. R. Protection of trees in grade changes. *Amer. Nurserym.* 79 (6), 1944 (9–11, 35–7, 42).

Raising or lowering the level of the soil brings about changes in soil aeration and water relationships which may have serious effects upon trees in the vicinity. Species such as Beech, Oak, Maple, Linden, and most conifers cannot, as a rule, withstand much fill over their roots, while Willow, Poplar, Locust, Sycamore and Ailanthus are more resistant. The lowering of the soil level may bring about equally unfavourable conditions through exposure and excessive drying.

The factors determining whether or not particular trees are worth the expense of protection are briefly outlined, and methods for protecting desirable trees from the effects of changed soil levels are explained and illustrated.

5. MENSURATION. INCREMENT. YIELD

52. MEASUREMENT OF TREES AND TIMBER

52 : 56 : 57.9. TISCHENDORF, W. Die neuesten Arbeiten und Aufsätze aus der Holzmassenermittlung. [The most recent works and treatises on the assessment of timber volume.] *Forstarchiv* 19, 1943 (206–16). [G.]

A review of 36 papers and books, mostly German, dealing with the measurement of felled timber and forest stands, yield-table construction, and the determination of stand increment.

52.1. *Diameter. Girth*

52.1. AMMON, R. M. Ergebnisse einer Zuwachskontrolle nach Stärkeklassen und Holzarten. [Results of an increment determination through repeated measurement by diameter classes and species.] *Schweiz. Z. Forstw.* 94, 1943 (243–8). [G.]

Results of increment determinations in a small forest in the Bernese midlands. Originally mainly composed of even-aged Spruce, the forest is now in the process of conversion to a mixedwood type. During the last 15 years Spruce has decreased in abundance from 70 per cent. to 62 per cent. of the stand, while Silver Fir has increased from 25 to 33 per cent. The growth of the Spruce tends to decline, while that of the Fir shows a steady increase. An attempt will be made by introducing native species into the stand to compensate for any further decrease in the increment percentage of the Spruce.

52.4. *Measurement of Volume*

52.43.2 : 12.25. BRIEGLEB, P. A. Sample scaling for west coast logs. *Timberman* 45 (4), 1943–44 (98, 100–2). [Pacific Northwest Forest and Range Exp. Sta.]

In order to determine the extent to which sample scaling [cf. *For. Abstr.* 5 (204)] is applicable in Oregon and Washington, a study was made in which random samples were taken from the records of individual log scales from representative timber sales in the Douglas Fir and Ponderosa Pine regions. These data were analysed by standard methods in order to give a basis for determining the number of logs that should be scaled in other timber of similar variability so as to obtain an estimate of average log volume within certain prescribed limits of error. A chart is developed, based on data from the most variable logs studied, by which it is possible to determine sample size in per cent. of total logs having given the total number of logs and the standard of accuracy required. Either random or systematic sampling may be used.

52.43.3. MEYER, H. A. A correction for a systematic error occurring in the application of the logarithmic volume equation. *Res. Pap. Pa. St. For. Sch.* No. 7 [1941?] pp. 3.

52.46. Strip Surveys. Enumerations. Timber Cruising

52.46. CROSBY, L. R. Practical timber cruising. *Loggers Handbook 1943* 3, 1944 (65–8). [Pacific Logging Congress, Portland, Oregon.]

Brief instructions on practical timber cruising are given with reference to crew and equipment, terminology, cruising methods, use of volume tables, volume estimating, the cruise report, and sketching topography.

56. INCREMENT

56 : 12.26–8 : 01.7. LAURIE, M. V. [Sandalwood problems—statistical methods for the determination of heartwood increment in Sandal.] With summary of debate. *Proc. 5th silvic. Conf. Dehra Dun, 1939, Item* 20 (c), 1941 (492–6, 497–8).

56.01 : 12.25 : 11.47.12. CONNECTICUT. Agricultural Experiment Station. Annual report for the year ending October 31, 1942, *Bull. Conn. agric. Exp. Sta.* No. 468, 1943 (57–95). I.I.E.

Measurements of the 1942 shoot growth of White Pine (*Pinus strobus*) saplings indicated that the increased rate of growth due to the presence of slash which was observed in 1941 had been maintained.

56.3. BÜHRER, H. Vom laufenden Zuwachs. [On current growth.] *Schweiz. Z. Forstw.* 95, 1944 (42–9). [G.]

The author stresses the difficulty of gaining a correct picture of the current increment of a stand by means of periodic calliper measurements in 4- or 5-cm. units.

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

57.9 : 22.82.1 : 12.26–8 (54). GRIFFITH, A. L., and RAM, B. S. Yield and stand tables for Sal (*Shorea robusta*, Gaertn. f.) high forest. *Indian For. Rec.* (*n.s.*) *Silviculture* 4-A, 1943. pp. ix + (171–287 + [1] + plates). [Forest Research Institute, Dehra Dun.]

The yield tables are for even-aged stands of seedling origin and combine data from most of the Indian provinces where the species occurs in quantity; the data are based on measurements from 225 sample plots in the United Provinces, the Central Provinces, Bengal Bihar, and Orissa. Included also are stand tables, which provide a ready means of determining diameter-class distribution. The yield tables represent a revision of those of Smythies and Howard, published in 1923, and the stand tables a revision of those of Mahendru, published in 1933.

6. MANAGEMENT. WORKING PLANS. SURVEYS

60. GENERAL LAND MANAGEMENT

60.3. *Management of Different Classes of Forest*

60.31 (71) : 32. HARRISON, J. D. B. Logger versus forester in Canada. *Aust. Timb. J.* 10, 1944 (142, 145, 168).

In present large-scale woods operations in Canada transition is taking place from uncontrolled exploitation to rational management. Although the ultimate objects of the logger and the forester may be in harmony, there is room for differences of opinion as to the speed with which desirable practices should be introduced. A satisfactory solution of such practical

problems can only be reached through close collaboration between loggers and foresters.

60.31 : 12.25 (77.3–6) : 12.19 : 23.1–2 : 57 : 63 : 24.2 : 22.1. EYRE, F. H., and LEBARRON, R. K. **Management of Jack Pine stands in the Lake States.** *Tech. Bull. U.S. Dep. Agric.* No. 863, 1944. pp. 66.

Jack Pine (*Pinus banksiana*) was once regarded as a weed tree, but is now extensively used for pulpwood and other forest products. The great extent of its distribution in the Lake States, where it covers nearly 3 million acres, is due chiefly to fire and to the peculiar seeding habit of the tree. Closed cones accumulate on the trees until a forest fire opens them and permits the seed to fall on the burned soil, which constitutes a favourable seedbed. Since in many cases Jack Pine does not regenerate successfully after logging, studies have been made of the factors governing its reproduction. These investigations, covering 14 years, indicate that in most places little seed is scattered from standing trees but that large quantities are stored in unopened cones. Logging transfers this seed supply to the slash. If cones lie on, or close to, the ground, they are opened by the heat of the sun and disperse the seed. In piles of slash the cones tend to remain closed. Mineral soil is the most favourable germination medium, but a burned duff surface is nearly as good. Young seedlings survive best on mineral soil. They make most rapid growth in full sunlight and require no shade, except in particularly hot situations. In order to compete with the ground vegetation the seedlings should have at least an equal start with it. Those germinating in spring or early summer have a better chance of surviving than those germinating in late summer or autumn; the latter are more subject to winter killing.

Jack Pine grows quickly and is relatively short-lived. It begins to decline in growth rate at the age of 50 years and generally matures when about 70 years old. Pulpwood is produced at the age of 30–35 years. Many stands of this age could be thinned and permitted to grow on so as to furnish saw logs and mining timber. Dense young stands benefit by thinning, since they are slow to thin themselves naturally and tend to stagnate. Clear cutting with mechanical ground scarification and scattering of cone-bearing branches is recommended for harvesting pure stands of mature Jack Pine and for obtaining natural regeneration. In warm situations, however, a partial cover of forest should be left for protection. Scarification with a disk plough ('Athens' type) drawn by a tractor has proved successful. The slash is not considered to constitute a serious fire hazard, so that the scattering of branches is quite practical.

Where growing in mixture with Red Pine (*P. resinosa*), Jack Pine may be removed in a series of partial cuttings, leaving the longer-lived and more valuable Red Pine to grow on. Much of the large area of deforested Pine lands in the Lake States is suitable for afforestation with Jack Pine. Essential requirements of successful planting are ground preparation, sturdy stock, and after-care to release seedlings from competing vegetation. Direct sowing of Jack Pine has proved successful on especially favourably sites. *From authors' summaty.*

60.31.1 (43.7) : 09.4 : 32. KOERNER, L. J. **Post-war forestry and lumbering in Czechoslovakia.** *For. Chron.* 20, 1944 (128–34).

In 1938 Czechoslovakia possessed 140,000 sq. km. of forests, of which 55 per cent. were coniferous, 30 per cent. deciduous and 15 per cent. mixed. The forests were mainly second growth, and were well managed and fully accessible. The annual growth was estimated at about 18,000,000 cu. m., and the annual depletion was kept below total increment in order to create reserves. Between 80 and 90 per cent. of the forest products were consumed within the country.

One-third of the total forest area, together with associated industries, was State-owned. The department concerned was run on fully commercial lines, and all returns were used for maintenance and improvement of the forests. As the largest single operator the State played a leading rôle in all forestry questions. Labour costs were low and little machinery was used. All work was piecework, and was considered seasonal. Mills were small-sized, most of them producing between 1 and 5 million bd. ft. a year. They were carefully operated to ensure a minimum of waste. In spite of low wages forest workers were ensured a good standard of living.

60.31–2 (47.3) : 96.1. TKACHENKO, M. E. Ratsionalizatsiya lesnogo khozyaystva vodookhrannoy i vodozashchitnoy zonÿ. **[Rationalization of forest management in water conservation and water protection zones.]** *Lesnaya Prom.* No. 4, 1943 (3–9). [Russ.]

The following are among the points noted in this article which reviews a number of forestry problems in the Ural Region of the U.S.S.R. The forest area of the Ural equals that of France and Germany together; Spruce/Fir stands predominate on the western, and Pine stands on the eastern, slopes. Past forest exploitation has often been unsound; some areas have been over-cut, others under-cut, and valuable timber has often been inefficiently used; too little attention has been paid to regeneration and fire protection. The evacuation of many industrial enterprises to the Ural has greatly increased the local demand for timber, and it is now essential to utilize the less accessible stands, particularly those that contain best quality timber. The temporary occupation by the enemy of Oak-producing areas has increased the need for finding substitutes for Oak timber, of which there is not enough in any case, and the Siberian Larch of the Ural offers good possibilities in this respect. Its utilization is not an easy matter, however, partly because of difficulties in floating owing to the high density of the timber.

A number of changes are necessary in the management practices for protection forests. At present no fellings of any kind are allowed within 3 km. of the Kama river. Such a sweeping prohibition is unsound, and the selective felling of mature or overmature trees in river-side forests cannot impair their protective value. Finally, it is pointed out that the cutting of hay in Ural forests is an undesirable practice that ruins regeneration. Areas that produce a very good crop of hay should no longer be regarded as destined primarily for timber production, but should be set apart for the production of hay.

61. SURVEYING. MAPPING

61.31. PEARCE, J. K. **Running compass and sketching topography.** *Loggers Handbook 1943*, 3, 1944 (69–71). [Pacific Logging Congress, Portland, Oregon.]

Notes are given on the use of a staff compass and aneroid barometer, the pacing of distances, and the sketching of topography in making a cruise (enumeration survey) and preparing a cruise map.

61.32. Pospíšil, R. Letecká fotogrametrie v lesnictví. [Aerial photography in forestry.] *Lesnická Práce* 21 (6), 1942 (237–47). [Cz.g.] U.S. Dep. Agric. Bibliog. 3, 1943 (G 40).

61.3–4 : 32. Miller, H. P. **Surveying and mapping: making of a detailed logging plan type map.** *Loggers Handbook 1943*, 3, 1944 (49–60). [Pacific Logging Congress, Portland, Oregon.]

61.4. Johnson, S. L. **Preliminary map surveys for timber operators.** *Loggers Handbook 1943*, 3, 1944 (60–1). [Pacific Logging Congress, Portland, Oregon.]

The author discusses briefly from the viewpoint of the timber operator the possible uses and limitations of cruiser type maps, reconnaissance type maps and maps prepared by Government departments.

61.4 : 67 : 55. Kientz, E. Neue Darstellungsgrundlagen für die forstlichen Wirtschaftskarten. [New principles of representation for working-plan maps.] *Z. Weltforstwirt.* 10, 1943 (259–69). [G.e.f.]

It is suggested that international symbols should be devised for, and used in the preparation of, stock maps, indicating clearly the year or period of germination for the trees composing each stand. A number of symbols are proposed. It is pointed out that the year of germination is a more accurate indication of the age than is the year of planting.

62. DIVISION OF THE AREA

62 : 67. Mantel, W. Die Unterabteilung. [The sub-compartment.] *Forstwiss Cbl., Thar. forstl. Jb.* (*Kriegsgemeinschaftsausgabe*) No. 4, 1943 (73–104). [G.g.]

The nature of the 'sub-compartment', which is the smallest unit into which forests are divided for planning, management, and record purposes, and the principles that must be followed in forming sub-compartments, are discussed with reference to German conditions.

8. ADMINISTRATION

81. ORGANIZATION. REGULATION OF SERVICE

81 (73). Clepper, H. **The engineer forestry units.** *J. For.* 42, 1944 (332–5). [Society of American Foresters.]

The writer discusses briefly the present distribution and activities of the engineer forestry units of the U.S. Army, the organization and equipment of an engineer forestry company, and the training and selection of personnel.

82. LABOUR QUESTIONS

82 : 32 : 07.7. Hilf, H. H. Die Erforschung und Verbesserung der Waldarbeit. [The investigation and improvement of manual work in forests.] M. u. H. Schaper, Hanover. 1941. pp. 80. [G.] [Institut für forstliche Arbeitswissenschaft, Eberswalde.]

This booklet comprises two lectures which the writer delivered at the Forestry High School of Stockholm. [Cf. *For. Abstr.* 5 (261).]

The first lecture deals with the general principles and methods of research on manual labour in forests; since 1926 this subject has received considerable attention in Germany. Many complex variables are involved in such a study: the physical and mental make-up of the labourer, the nature of the work and the methods used, the type of tools used, and the labourer's environment during work; it is difficult to isolate any single variable for study. The methods and difficulties of such research are illustrated by a few examples from the experience of the Forest Labour Research Institute at Eberswalde. The principal achievement of this Institute has been the preparation of a pamphlet on the proper maintenance of forest saws; 35,000 copies of this pamphlet have been published and used in the training of many forest labourers.

The second lecture gives examples, illustrated by photographs and drawings, of ways by which forest labour can be improved. Usually it has been found that an improved technique gives better results at less cost. For instance, planting of Birch on strips worked by a forest plough has given better growth and has proved cheaper than planting on hoed spots. Again, the use of acid stimulants in resin tapping has increased the yield while lowering costs. It is stressed that the manual work of forestry must be adequately planned and that the continuity of the work should be maintained as far as possible.

Each lecture concludes with a bibliography giving the relevant German publications on the subject.

82 (94) : 38.2. **Forest housing in N.S.W., present and future.** *Aust. Timb. J.* 10, 1944 (155, 157, 167).

In the past the housing of forestry personnel has left much to be desired. In future the N.S.W. Forestry Commission plans to house its personnel in forest villages rather than in a scattered fashion, and to adopt satisfactory types of construction. The basic principles of suitable designs are outlined briefly.

82 (66.7) : 98.1. Wills, J. A. **Kumasi timber producers' co-operative society.** *Farm and Forest* 5, 1944 (33–6).

This association of 'pitsawyers' was formed in Ashanti in 1941 and operates in close collaboration with the forestry and agricultural authorities. The society collects hand-sawn timber from its members, which it sells after careful seasoning, largely to Government and military departments. It maintains stocks of sawn timber of standard sizes and an increasing variety of species. Members enjoy, among other benefits, a steady outlet for their produce and increased returns due to the well-seasoned condition of the goods. The society has been very successful and its financial position is sound.

9. FOREST POLICY

9 (71). Bracken, J. **A national forest policy.** *Pulp Paper Mag. Can.* 45, 1944 (537–8, 540).

The extent of Canada's forest resources and problems concerned with their management are discussed, and proposals are made for a national forest policy as a basis for the future prosperity of the country.

90. GENERAL PRINCIPLES OF FOREST POLICY

90 (729.9) : 86. **Forestry in the Leeward Islands. Reports by the Conservator of Forests, Trinidad and Tobago, after preliminary visits by J. C. Cater, Assistant Conservator.** *Bull. Devel. Welfare W. Indies* **No. 7, 1944. pp. 106.**

Each of the reports, based on a preliminary study of the conditions on the islands of Antigua, St. Kitts, Nevis and Montserrat, is presented in four parts: (1) A general description of the island and its resources; (2) bases on which the forest policy should rest; (3) general forest policy advocated for the island in question; (4) detailed recommendations to implement the forest policy. Appendices to each report deal with: (1) Botanical names of trees. (2) Suggested forestry ordinance for each island.

91. SOCIAL AND ECONOMIC SIGNIFICANCE OF THE FOREST

91 (71.1). **The place of British Columbia forestry in post-war rehabilitation plans.** *B.C. Lumberm.* 27 (12), 1943 (27–8).

Report on discussions at a meeting of the Vancouver Section of the Canadian Society of Forest Engineers. The principal speaker was Chief Forester C. D. Orchard, who outlined the recommendations of the Interdepartmental Advisory Committee on Forests and Parks of the Provincial Government Post-War Rehabilitation Council with special reference to the employment that will be available in public forestry. More than nine million acres have been dedicated to 'Parks and Recreation' under present legislation, and it has been estimated that 321,000 man-days will be absorbed in long-term improvements planned in this connexion. About 50,000 man-days will be required in preparing sites and 145,000 man-days in planting in connexion with afforestation projects. Forest management and protection can absorb about 630 men in continuous work and an additional 1,100 in seasonal work. It is thought that work in connexion with the establishment of demonstration forests and other forestry extension activities will also make use of a certain amount of labour. Estimates of employment on all the above indicate that about 4 million man-days of work will be available over and above permanent appointments. This would require 13,000 men for one year. However, it is estimated that the Forest Service could supervise and use efficiently not more than about 2,500 to 3,000 men, so that the work would have to be spread over a longer period.

91 (729.5) : 07.1. GAZTAMBIDE, J. B. Enseñanza de los valores del bosque y de la dasonomia a los niños de Puerto Rico. **[Teaching the value of the forest and of forestry to the children of Puerto Rico.]** *Carib. For.* 5, 1944 (68–77). [Span.e.]

Forestry instruction is given to boys through the medium of special clubs in 33 vocational schools. The 'club forestry course' lasts four years. In 1942 some 1,800 boys took part in the training. The pupils are trained to perform the duties of a forest guard.

91.1. *Rural Preservation. Reserves. National Parks*

91.1 (54). SEN GUPTA, J. N. **[Preservation plots and protected trees.]** With appendix (including notes by D. Davis and L. R. Sabharwal) and report of debate. *Proc. 5th silvic Conf. Dehra Dun, 1939, Item* No. 13, 1941 (331–8, 338–45, 346–8).

This paper records the action taken since about 1929 by the forest departments in India and Burma to select and maintain areas of the chief types of forest and of exceptional trees for permanent protection. Tabulated data and reports on over 130 plots show that considerable, if unequal, progress has been made. Early action is needed to complete the selection and demarcation of plots, the main object of which is either (i) to preserve the existing forest as far as possible in its present form, or (ii) to preserve the forest from all forms of injury and so to permit progression towards the climax form. Details of the treatment appropriate to each objective should be prescribed for each plot.

91.3. *Influence of the Forest on the Environment*

91.3 : 11.62. BURGER, H. Einfluss des Waldes auf den Stand der Gewässer. III. Mitteilung. Der Wasserhaushalt im Sperbel- und Rappengraben von 1927/28 bis 1941/42. **[The influence of woodland on the water régime. Part III. The water régime in the Sperbel- and the Rappengraben from 1927–28 to 1941–42.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 23, 1943 (167–222 + plates). [G.g.f.] E.F.A.

Report on the results of measurements made during the past 15 years in this investigation, which has been described previously by Engler (1919) and Burger (1934). In the Sperbelgraben, which is almost entirely wooded, evaporation and transpiration averaged 50 per cent. of the precipitation, while in the Rappengraben, which is wooded over about one-third of its area, it averaged 38 per cent. During heavy rainfall following wet weather and during the snow-melting period, stream flow was almost invariably much higher in the Rappengraben than in the Sperbelgraben. On the other hand, the stream flow was greater in the Sperbelgraben after a pronounced drought. The amount of debris per sq. km. of the catchment area that was carried away by water was significantly higher in the Rappengraben. Recent infilitration tests in the two areas have confirmed that 100 mm. precipitation is absorbed by a good forest soil in 1–2 minutes, as against 1–5 hours in the case of a hard pasture soil. Following a precipitation of 50 mm. in 50 minutes no measurable surface run-off occurs on the forest soil type, whereas a 60-per-cent. run-off results on the pasture type.

91.3 : 11.47.6 : 21.3 : 33.06. VOORENDYK, J. J. **Effect of tree-planting on soil fertility.** *Fmg. S. Afr.* 18, 1943 (673–6, 678). [Division of Forestry, Pretoria.] A.P.B.

Points in favour of planting trees in Pretoria are discussed briefly. Possible beneficial effects of trees on soil fertility include increase in the humus content of the soil, improvement in its physical condition, a more gradual penetration of rainfall into the soil, protection against wind and sun, modification of the microclimate, development of biological and chemical activity in the soil, and control soil erosion; in addition, the nutrient requirements of trees are relatively small. The extent to which trees influence soil fertility will depend on the climate of the area concerned, the species planted and their management, and on any special local conditions.

Trees provide the cheapest and most satisfactory fuel for farm use and so obviate the need for using farm manure for this purpose.

91.5. *Value of the Forest for Colonization*

91.5 (71.4) : 82. MENARD, E. Forest colonies. *For. Chron.* 20, 1944 (119–27).

The author contends that the chief factor preventing optimum forest exploitation in Canada is the lack of

permanent forest workers. Good results cannot be expected from temporary workers who have no interest in the forest itself. It is therefore suggested that forest colonies should be established, each consisting of about 60 families who will devote all their attention to the exploitation of nearby forest and practice silviculture under the guidance of trained foresters. A table and diagram show the number of permanent and seasonal workers that would be needed for each month of the year for an annual cut of 100,000 cords, giving the labour distribution in each category for the various operations.

The advantages to the workers would include a fair wage, low cost of living, a home near to their work, free forestry training and land for cultivation. For the employers there would be no labour problem, men would be better trained and would give better service because their livelihood would depend on the forest. With improved management the yield per acre would be increased. Forests should be made more accessible by the construction of good road systems.

91.8. *The Forest as a Source of Employment and Income*

91.8 (71.1). KERR, A. S. **Soldier settlement and the timber industry.** *B.C. Lumberm.* 28 (2), 1944 (50 D, 71–2).

The plan outlined in this article refers especially to the lower coasts of Vancouver Island and the adjacent mainland. It is suggested that many servicemen, notably those previously engaged in the timber industry, could be settled after demobilization in colonies where they would derive their livelihood partly from farming and partly from the recovery of small timber from logged-over and certain other forest areas. These settlements would have to be sponsored by the Dominion Government.

92. FOREST LAW

92 (494). BAVIER, B. Lignes directrices pour une revision de la législation forestière suisse. **[Guiding principles for a revision of Swiss forest legislation.]** *J. for. suisse* 93, 1942 (241–5); 94, 1943 (5–11, 34–41). [F.]

This paper contains various suggestions made on behalf of a special committee of the Swiss Forest Society for the revision of federal legislation.

92 (494) : 96. PETITMERMET, M. Quelques considérations sur la législation forestière en Suisse. **[Some observation on forest legislation in Switzerland.]** *Intersylva* 2, 1942 (23–9). [F.g.e.span.ital.]

The history of Swiss forest legislation is outlined. The law of 1902, which is still in force, has proved very beneficial, notably in assuring proper treatment of protection forests and the maintenance of the total forest area of the country.

92 (73) : 91. UNITED STATES. **An act to promote sustained-yield forest management in order thereby (*a*) to stabilize communities, forest industries, employment, and taxable forest wealth; (*b*) to assure a continuous and ample supply of forest products; and (*c*) to secure the benefits of forests in regulation of water supply and stream flow, prevention of soil erosion, amelioration of climate, and preservation of wildlife.** *Public Law* 273—78th Congress. **[Chapter 146—2nd session.] [S. 250.] [n.d.] pp. 4.**

92 (75.2). KAYLOR, J. F. **Maryland's Forest Conservancy Districts Law.** *J. For.* 42, 1944 (352–4). [Department of State Forests and Parks, Annapolis, Md.]

The Forest Conservancy Districts Act was passed by the Maryland Legislature in 1943 and became effective January 1st, 1944. The writer outlines the major provisions of the law, explains how it is expected to work, and discusses the States plans for co-operation with woodland owners and operators.

92 (87). MEYER, H. A. **Forest legislation in Venezuela.** *J. For.* 42, 1944 (285–6). [Foreign Economic Administration, Caracas, Venezuela.]

By the new law (Ley de Bosques y Aguas) of July 4, 1942, the forests and waters of Venezuela are declared a 'public utility', and all forestry activities are placed under the direction of a forestry board (Consejo Forestal) which is responsible for the policy and action to be followed in dealing with forest land. Separate chapters of the law are concerned with the forest protection, administration, and exploitation of public and private lands, reforestation, management of water resources, and penalties to be imposed for violations of the law.

94. FOREST OWNERSHIP

94 (73). MCCULLOCH, W. F. **The ownership of forest lands.** *Timberman* 45 (8), 1943–44 (25, 52, 54, 56).

A critical discussion of arguments in favour of increased public ownership of forests in the United States; possible limitations of such ownership are suggested.

94.12 (73) : 91.8. **The community forest in the postwar period. Report of Committee on Community Forests, Society of American Foresters.** *J. For.* 42, 1944 (343–51).

This report discusses the part that community forests should play in the post-war programme of the United States by providing employment on self-liquidating work projects, and by conserving and developing the forest resources of the country.

96. POLICY REGARDING PROTECTION FOREST AND DEFORESTATION

96.5 : 23.3 : 92. LUNCZ, G. La législation sur le reboisement des terrains incultes. **[Legislation on the reforestation of waste land.]** *Silvae Orbis* No. 2, 1940. pp. v + 266. [F.]

The problem of waste-land afforestation has received considerable attention at different international congresses of the past. In the present monograph the author presents, in extract, the relevant legislation of some 50 countries (including colonies). This, the most voluminous part of the work, is preceded by a general discussion of the concept of waste land and of State control and encouragement in matters of waste-land afforestation and the treatment of waste lands that have been wooded.

96.5 (494) : 97.2–3. HESS, E. Neuere Gesichtspunkte der schweizerischen Forstpolitik. **[More recent aspects of Swiss forest policy.]** *Schweiz. Z. Forstw.* 95, 1944 (33–42). [G.g.]

The author stresses the desirability of increasing the forest area of Switzerland by afforestation of unproductive land. In selecting areas for this purpose, there must be close co-operation between agricultural and forestry authorities. Such co-operation is also needed

in the planning and execution of projects for the segregation of forest and pasture, in road building, river training, etc.

96.5 (77.2) : 23.3. **Reforest in Indiana.** *Amer. Nurserym.* 79 (11), 1944 (25).

In 1941 an act was passed by the Indiana Legislature requiring each company that was surface mining to plant each year an area equal to that stripped for coal. Technical advice on the problems involved is given to the companies by the State Forest Division. Plans for the spring of 1944 called for the planting of more than 2,000,000 trees on over 2,000 acres of spoil banks.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

97.1 (41.1–4). GREAT BRITAIN. **Utilisation of land in the rural areas of Scotland. Report of a Committee appointed by the Secretary of State for Scotland in reference to the recommendations of the Committee of Land Utilisation in Rural Areas in England and Wales.** With appendix. H.M. Stationery Office, 120, George St., Edinburgh, 2. Cmd. 6440, 1943. pp. 4.

97.1 (729) : 11.62 : 07.2 : 4 : 60.3 : 31. **Recommendations of the Soil, Water and Forest Conservation Committee of the fourth meeting of the Anglo-American Caribbean Commission.** *Carib. For.* 5, 1944 (78–83). [E.]

An abstract is presented of the forestry research programme drawn up by this meeting, which was called primarily to consider ways and means of coordinating existing programmes of agricultural, fishery, and forestry research in the area.

97.1 (73). PEARSON, G. A. **Multiple use in forestry.** *J. For.* 42, 1944 (243–9).

Comments are given on a series of papers on multiple land use, published in the *Journal of Forestry* 41, 1943 (627–44; 705–21; 792–807), and the view is expressed that multiple use, while coordinating several uses, must retain the feature of specialization in order to promote efficiency.

97.1 (94.4) : 61 : 11.2–4 : 12.19 : 11.6 : 60. SMITH, R., HERRIOT, R. I., and JOHNSTON, E. J. **The soil and land-use survey of the Wakool Irrigation District, New South Wales.** *Bull. Coun. sci. industr. Res. Aust.* No. 162, 1943. pp. 59 + maps.

97.1–2 (410). ADAIR, W. **Sheep v. timber in Scotland: the post-war forest policy.** *Fmg. News* 95 (26), 1943 (3). O.R.E.

97.1–2 (494) : 96.3. LEIBUNDGUT, H. Waldbauliches zur Rodungsfrage. **[Silvicultural considerations on the question of clearing.]** *Schweiz. Z. Forstw.* 93, 1942 (299–304 + plate). [G.]

A discussion on the problem of forest clearance for agricultural purposes. The author is particularly opposed to the clear-cutting of Swiss woodlands of the *Quercus/Carpinus* type and claims that substitute plantations, particularly of conifers, in the mountain districts are no compensation for the loss of the mixed hardwood forests of the midlands. The alternative method of interplanting with agricultural crops is unsatisfactory as the composition of the forest floor is thereby basically disturbed, and soil improvement can again take place only very gradually. He enumerates some points that should be borne in mind when the agricultural use of forest land is under consideration.

97.1–2 (494) : 96.3. PALLMANN, H., and RICHARD, F. Bodenkundliche Bemerkungen zur Rodungsfrage mit besonderer Berücksichtigung der Verhältnisse im schweizerischen Mittelland. **[Pedological observations on the question of clearing land with special reference to conditions in the Swiss midlands.]** *Schweiz. Z. Forstw.* 93, 1942 (287–99). [G.] [Agrikulturchemisches Institut der ETH, Zürich.]

Owing to the increased need in Switzerland for home food production, the question of the clearing of forest land for agricultural purposes has arisen, especially in the Swiss midlands. After a general review of forest soil types as to their suitability for agriculture, the author discusses the advisability or otherwise of replacing the main tree communities by food crops. He concludes that, wherever possible, the native *Quercus/Carpinus* woodlands should be spared, and recommends the prior removal of pure stands of non-indigenous Spruce wherever this species occurs on soils suitable for agriculture.

97.1–2 (73) : 60.31.2 : 11.62.11. ROGERS, R. W. **Soil conservation spreads across the land.** *Soil Conserv.* 9, 1944 (246–51, 255).

A general article on the value of soil conservation. Reference is made to the assistance given by the United States Soil Conservation Service to farmers and ranchers, and to the great increases in agricultural production due to the application of conservation measures. Soil conservation is spreading also to farm woodlands, and since May, 1937, 46 farm forestry projects have been established in 34 states to protect woodlots from the harmful results of malicious burning, overgrazing, and improper cutting. In addition, the government has purchased 212 more or less derelict areas containing over 10,000,000 acres, some of which may in due course again make major contributions to the national economy. Urban dwellers and farmers alike share the responsibility of promoting better land utilization through conservation practices.

97.3 (494) : 24.4 : 12.25. SCHÖNENBERGER, E. Wald und Weide im Berner Jura. **[Forest and pasture in the Bernese Jura.]** *Schweiz. Z. Forstw.* 94, 1943 (169–183 + plates). [G.]

A general discussion on the 'Wytweiden' or wooded pastures of the Freiberge district. The woodland is here broken up into small clumps or single trees set in a grassy sward used for pasturage. Timber production is of less moment than the rearing of livestock, particularly horses, but the trees are of great importance in sheltering the pasturage from rain, cold and wind, and in improving moisture conditions for grass growth. As a rule trees occupy not more than 40 per cent. of the area, the chief species being Spruce (85 per cent.) and Silver Fir (10 per cent.). The remaining 5 per cent. are mostly hardwoods.

97.3 (73) : 45.11. PRESTON, J. F. **Livestock in the farm woodland.** *Soil Conserv.* 9, 1944 (271–3, 279).

While admitting that the grazing of livestock in farm woodlands is a problem which must be solved according to conditions obtaining in individual farms (type of forest, kind of livestock, intensity and season of grazing), the author tends to hold the opinion that, generally speaking, controlled grazing is not inconsistent with the principles of good forestry.

97.3 : 12.19.3 (78.7–8) : 34.27 : 12.26–8. COSTELLO, D. F. **Important species of the major forage types in Colorado and Wyoming.** *Ecol. Monogr.* 14, 1944 (107–34). [Rocky Mt. Forest and Range Exp. Sta.]

An account is given of the major forage types of the Great Plains, the mountain region, and the semi-desert area of Colorado and Wyoming. For each forage type the following information is presented: (1) the most important plants; (2) the frequency of occurrence and relative amount of forage produced by these plants; and (3) a brief statement of the values of these plants in developing range management plans.

In the mountain region ten forage types are distinguished: (1) alpine and subalpine; (2) Spruce/Fir; (3) Lodgepole Pine; (4) Aspen; (5) Ponderosa Pine/Douglas Fir; (6) wet meadow; (7) park; (8) sagebrush; (9) Piñon/Juniper; and (10) browse-shrub. The forage species consist mainly of grasses and herbaceous plants, but several trees and shrubs are included in the lists of species browsed. Best grazing is obtained in the alpine grasslands, the meadow type, and in open stands of Aspen or Ponderosa Pine.

98. THE TIMBER MARKET

98.1 (485) : 09.4. **Sweden's timber resources.** *Engineer, Lond.* 177 (4616), 1944 (516).

The total resources of the two northern provinces are said to have decreased by 8½ per cent. to 306 million cu. m. (1,090 million cu. ft.) during the last 10 years.

98.1 (68.9) : 61.31 : 04.4. NORTHERN RHODESIA. **Native timber supplies of the Copperbelt: reconnaissance report.** [Northern Rhodesia Chamber of Mines.] 1943. pp. 3 + map.

98.1 (68.9) : 52.46 : 04.4. NORTHERN RHODESIA. **Report on the survey of timber supplies in the woodlands of the Copperbelt.** [Northern Rhodesia Chamber of Mines.] 1943. pp. 8 + 2 sample pages + tbls.

By 1942 all the copper mining companies of Northern Rhodesia had adopted the policy of using where possible local timber instead of imported timber. Beyond the very general location of several well-timbered areas, nothing was known of the extent of the timber resources of the Copperbelt, and no general map of the Copperbelt was available large and accurate enough for the assessment even of these areas. It became urgently necessary to compile a suitable topographical map, to reconnoitre all areas that carried trees sufficiently large to yield saw timber, and, finally, to find out how much mining timber could be obtained in the various districts. The work was undertaken by the Northern Rhodesia Chamber of Mines with the financial support of Government. The survey was carried out in two separate stages—reconnaissance in 1942 and strip enumeration in 1943. The reports present the data obtained in the reconnaissance and the strip-enumeration survey. The maps prepared include a principal forest map of the Copperbelt on the scale of 1 : 50,000, and exploitation maps for each of the areas enumerated. The latter show boundaries, roads, etc., the location of the sample strips and the volume of saw timber per acre.

98.1 (71) : 33.02. JONES, D. **Our future wood requirements.** Canadian Pulp and Paper Association, Montreal. [*Woodlands Section Index* No. 714 (c–l).] 1944. pp. 4.

The writer discusses the future wood requirements of the pulp and paper industry in eastern Canada, with reference to both quality and quantity of raw material. In conclusion it is suggested that to help meet requirements woods operators should consider the possibility of: (1) increasing the productivity of woods labour; (2) eliminating waste in forest operations; (3) segregating species; (4) segregating soft woods from hard woods; (5) shipping wood before it has dried below 30 per cent. moisture content; (6) practising sound forest management.

98.1 (73). **Annual lumber production by species.** *J. For.* 42, 1944 (374–5).

The annual lumber production of the United States for the years 1939 to 1943 inclusive is tabulated by species.

98.1 (73). **The Timber Production War Project: a symposium. [1] The War Production Board's interest in the project, by A. E. Fivaz. [2] An opportunity and a public trust, by H. M. Collet. [3] The project in the northeast, by W. S. Swingler. [4] Operation of the project in Virginia, by C. W. Mattison.** *J. For.* 42, 1944 (336–44).

The Timber Production War Project was set up in the United States in 1943 for the purpose of assisting operators to increase production of lumber, veneer logs and pulpwood in the eastern States. In these four papers the writers discuss the origin, organization, operation and accomplishments of this project. It was estimated at the end of December, 1943, that the assistance given by the T.P.W.P. and its co-operators had resulted in additional production equivalent to 215 million bd. ft.

98.1 (941). **Timber supplies in Western Australia. Extract of evidence given before the Commonwealth Housing Commission.** *Aust. Timb. J.* 10, 1944 (29).

On the basis of an annual production of over 14 million cu. ft. (in 1937–38 the cut of sawn and hewn timber was 14·3 million cu. ft.), it is calculated that Western Australia would have sufficient timber for the construction of 4,500 homes per annum, a number that could be doubled by reducing timber exports. The capacity of existing kiln seasoning plants is considered adequate.

98.1–2 (71). **The effects of the war on Canadian forestry.** *Repr.* from *Canada 1944.* 1944. pp. 18 + plates.

A brief note is given on the forest resources of Canada followed by an account of statistical and other information relating to the war-time production of the lumber, pulp and paper, and secondary timber industries of the country, and of the administrative and technical problems involved in maintaining production at the required level.

98.2 : 09.4. GROTTIAN, W. **Die Umsatzmengen im Weltholzhandel 1925–1938. [The world timber trade by quantities of produce, 1925–1938.]** *Silvae Orbis* No. 3, 1942. pp. viii + 164. [G.] [Deutsches Institut für Wirtschaftsforschung.]

This monograph is based chiefly on the foreign-trade statistics of the various countries. A general summary of international timber trade is followed by accounts by countries (39 in all, including almost every European country) and categories of produce. These include firewood, charcoal, saw timber in the round, pulpwood, mining timber, hewn timber, sleepers, sawn timber, plywood, pulp, paper, and cardboard. The statistical data are presented in 117 tables.

Judging by foreign trade data of 35 countries, which, it is suggested, account for 95 per cent. of the world's international trade in timber, the turnover of this trade, expressed in solid cu. m. of raw wood, increased from about 120 million cu. m. in 1925 to 150 million cu. m. in 1929, then decreased to 95 million cu. m. in 1932, and increased again to 130 million cu. m. in 1937. There was a marked decline in 1938. In 1937 only about 8 per cent. of the world's production of wood or 18 per cent. of that of timber reached the international market (the production of wood being put by the author at 1,600 million cu. m. and that of timber at 700 million cu. m., based on estimates by Zon and Sparhawk).

NOTES FROM THE DAILY AND THE NON-TECHNICAL PRESS

References: 1. *Beyoglu*, Istanbul. 2. *Domestic Commerce*, Washington. 3. *Foreign Commerce Weekly*, Washington. 4. *Kölnische Zeitung*, Cologne. 5. *Reich*, Berlin. 6. *Timber Trades Journal*, London. 7. *Ulus*, Ancara. The numbers in brackets indicate the reference number and the date of publication of the newspapers and journals to which the annotations refer.

Brazil. Several years ago the railway company Paulista began an afforestation programme by planting Eucalypts along its railroad lines. The company owns over 60,000 acres of land and has planted 31 million trees, including 24½ million during the past 7 years. The wood from these plantations is used to some extent for posts but mainly for fuel. The fuelwood rotation is 7 years (3; 8.7.44).

Canada. By an order now in force in British Columbia, the burning of sawdust and other wood as waste is made illegal. The reason for the order is that the sawdust is needed to supplement fuel supplies and for manufacturing purposes. There is said to be a serious shortage of wood waste for pulp and paper mills and other industrial enterprises (6; 5.8.44).

Denmark. According to the *Kölnische Zeitung* (4; 19.8.44) negotiations between the authorities and the woodland owners have led to the obligatory cut for this year being fixed at 1·8 million cu. m. (Raummeter) as against 1·925 million last year.

Finland. The assessment of war damage to the forests of Finland is practically completed. Altogether over 200,000 ha. have been damaged by fire, shelling or felling for military purposes. This represents a loss of about 600 million marks (Exchange (pre-war) 227 F.M. = £1). The damage is heaviest in Karelia (3; 6.5.44).

Mexico. From an article by J. L. Muller and T. P. Deuber on the development of Mexico's forest resources (3; 24.6.44):—The following table, though based on incomplete data, gives an indication of the location of sawmills in the various States of Mexico.

State	*Number of mills*	*State*	*Number of mills*
Campeche	5	Nuevo Leon	8
Chiapas	3	Oaxaca	3
Chihuahua	23	Puebla	9
Coahuila	3	Sinaloa	7
Colima	7	Sonora	6
Durango	35	Tabasco	4
Federal District	6	Tamaulipas	4
Guerrero	3	Veracruz	24
Jalisco	3	Yucatan	5
Mexico	1		

There is little information on the size and capacity of each mill, but it may be assumed that most are small and lack modern equipment.

The available statistics indicate that the annual cut increased from about 200 million bd. ft. in 1907 to approximately 1,000 million bd. ft. in 1913, and the present cut is probably near this figure. Domestic lumber production in 1928 has been estimated as follows:—

	Million bd. ft
A. *Softwoods*	
Large mills	300
Small mills	100
Hewn timber	200
B. *Hardwoods*	
Small mills	25
Hewn timber	150
C. *Unlisted sawmills*	25

It is said that the industry is indifferent to quality of production and seasoning, and that this is the most serious obstacle to its development to an extent commensurate with the forest wealth of the country.

The present plywood production of Mexico is estimated at 19·2 million sq. ft. per annum. The output may soon reach a higher level owing to increases in production planned by two large mills and the entry into production of two small mills. The most important buyers are furniture manufacturers, who take 80 per cent. of the entire output (3; 15.7.44).

Norway. Motor transport in Norway is now largely dependent on producer gas, but the supply of producer fuel appears to be inadequate. Timber concerns are said to supply some 5 million cu. m. of generator wood annually, peat production is believed to amount to about 2 million cu. m., and charcoal production to 1½ million cu.m. It is reported that a factory for the purifying of producer charcoal is under construction in Oslo, and that it will have a monthly capacity of 7,500 cu. m. (3; 29.7.44).

Peru. From an article by J. L. Muller and T. P. Deuber on the wartime crisis in Peru's timber industry (3; 29.7.44):—Although the forest area of Peru is reported to be 220 million acres, or about one-half of the land area, this country before the war relied to a great extent on imported timber, which was obtained chiefly from the U.S.A., Canada, Chile, and Ecuador, and in recent pre-war years imported timber accounted for as much as 50 per cent. of the domestic consumption. The war has increased greatly the demand for timber while leading to a drastic reduction in imports, and Peru is now attempting to establish a more highly developed industry, which will serve the national economy not only during the present crisis but also after the war.

The principal forests are located in the Montaña region in the eastern part of the country beyond the Andes; this region forms the upper part of the Amazon Basin. Before the war the sawmilling centre of Iquitos served the whole of the Montaña; it produced about 6 million bd. ft. of timber annually, of which 4 million bd. ft. was Cedar (*Cedrela odorata*) and the remainder Mahogany (*Swietenia macrophylla*), most of which was usually exported to the U.S.A. Of the Cedar, about one-half was consumed locally and the remainder shipped to western Peru. A new sawmilling centre has been established recently at Tingo Maria.

In the past, timber shipments from Iquitos have always been dispatched down the Amazon in ocean-going steamers; even timber destined for the Peruvian west coast has followed this route and reached its destination via Belem (Para) and the Panama Canal. Before the war these shipments averaged about 2 million bd. ft. per annum and consisted mainly of Cedar. Under present conditions it has not been possible to continue this method of transport and the resources of the Montaña have had to be tapped from the west. The recently completed trans-Andean highway provides the much-needed outlet for this purpose.

Other forest areas, though small in comparison with that of the Montaña, are found in the Sierra region—the valleys between the eastern and western Cordilleras—and in the north-central part of the coastal region. These areas are especially important to the economy of Peru since they provide local markets with cheap timber.

The coastal area has two logging centres, of which the more important is in the vicinity of Chiclayo, and the other in that of Piura. Both produce Algarrobo (*Prosopis chilensis*), which is used mainly for railway sleepers, but also for charcoal making.

The forest areas of the Sierra are very important as they provide the bulk of the timber consumed within the country. The produce is mostly Eucalypt timber, *Eucalyptus globulus* being the chief species cut in Peru. In the past Eucalypt wood was used mainly for mining timber, though small quantities were used in the manufacture of box shooks. Now, however, the timber is used largely for railway sleepers. Although the suitability of Eucalypt sleepers has not been fully established, since at the present time unseasoned sleepers are used, the development is worthy of note. It has been reliably reported that preservative-treated Eucalypt sleepers have so far proved satisfactory, and it is quite possible that they will find permanent use in some parts of Peru in preference to sleepers imported from the U.S.A. Of late, interest has been focused on the Cuzco region of the Sierra, where the exploitation of timber is a recent development.

The estimated average annual production of timber in Peru is as follows: Montaña, 10 million bd. ft. of tropical hardwoods; Sierra, 16 million bd. ft. of Eucalypts; coastal regions, ¾ million bd. ft. of Algarrobo. The following table, while not quite complete, gives a good indication of the location of Peruvian sawmills.

Region	*Sawmilling centre*	*Number of mills*
Montaña	Iquitos	11
	San Ramon	4
	Satipo	6
	Tingo Maria	4
Sierra	Cuzco	1
	Huancayo	7
	Huanuco	1
Coast	Arequipa	3
	Chiclayo	1
	Ica	3
	Lima-Callao	7
	Pisco	2
	Talara	1
	Trujillo	2
	Piura	1

Sweden. A new type of fibre-board has been produced by the A/B Kramfors under a patented process. The board, called 'Kramfors Plattan', attracted considerable attention at a forestry conference held in Stockholm. It is very resilient, and does not show heel marks. The board is manufactured in thicknesses ranging from 3 to 7 cm. (3; 20.5.44).

Switzerland. According to the *Reich* (5; 21.5.44) the average annual increment of Swiss forests amounts to 3 million cu. m. of which 50 per cent. is timber and 50 per cent. firewood. Timber imports totalled some 400,000 cu. m. in 1939, but during the war these have practically ceased, while difficulties in coal imports have increased greatly the demand for fuelwood. In 1942 the cut amounted to over 5 million cu. m. and was even higher in 1943. At present 30 per cent. of the cut consists of timber and 70 per cent. of firewood. About one-quarter of the firewood is consumed in the manufacture of charcoal, chemicals, and paper, while 2·6 million cu. m. is used directly for heating.

Turkey. *Beyoglu* (1; 11.4.44) contains an article on the Eucalypt forests planted since 1939 in the swampy regions at Karabujak and Aynoz, near Tarsus. Previous efforts to cultivate these swamps had failed, and great difficulties were experienced in draining the soil sufficiently to permit the growth of seedlings, though this was finally accomplished. The object of the afforestation work was twofold: to drain the malarial marshes and to provide pitprops and other timber. The Karabujak forest is intended to supply eventually 172,000 cu. m. of pitprops per annum—enough to satisfy the needs of the Zonguldak coalfield. Produce would also be available for telegraph poles, fuel, and other purposes. It is hoped that Eucalypt forests will also be planted in other regions.

Ulus (7; 19.7.44) reported that the new paper and cellulose plants at Izmit were to be opened on the 24th of July.

United States. From an article by G. R. Coxe on the future export markets for American pulp and paper (3; 13.5.44):—In the five-year period 1935–39, United States sales abroad of paper base stocks (chiefly wood pulp) and paper and manufactures averaged approximately $40 million per annum. The value of wood pulp exports rose from $2,729,300 in 1929 to $6,493,140 in 1939. In the same period the value of exports of paper and manufactures fell from $37,086,000 to $30,492,000 (despite an increase of over 7 per cent. in the tonnage exported). At present all indications support the assumption that there will be no surplus of pulpwood, pulp, or paper in the United States for at least two or three years after the end of the war in Europe. While the domestic consumer demands may decrease somewhat during the immediate post-war period, the replacement of inventories and export demands are likely to exceed the supply capacity. Until the European industry is rehabilitated, American manufacturers and exporters will have exceptionally good opportunities for developing foreign markets.

From an article by J. L. Muller and M. A. Dietz on the problems of the American lumber industry (2; June, 1944):—In pre-war years the lumber industry employed about 600,000 persons, 98 per cent. of whom were male workers. To-day, less than 450,000 persons are employed, and of these 88 per cent. are male workers. The rate of labour turnover rose sharply during the first half of 1942. In January, 6·53 per 100 employees left the industry, a rate not much higher than the average for all manufacturing industries. By August, however, the rate was 13·13 per 100 employees, or nearly twice that of the manufacturing industry as a whole. Accession rates have not kept pace with loss of manpower. Employment of women, especially in sawmills, has help considerably, and so has the institution of a longer working week. About 500 prisoners of war have also been employed by the industry. In the past, the enterprises situated in the Northeast have benefited by the employment of a substantial number of Canadians during the winter cutting season. Owing to the shortage of manpower in Canada, the number of men available from this source during the past few years has fallen off considerably. In February, 1944, an appropriation was approved whereby the War Manpower Commission expects to import anything up to 1,500 workers from British Honduras for work in logging and lumber production. Plans for the execution of this programme are still in an early stage.

The number of lorries normally used by the industry at any given time for transporting logs and lumber is estimated at over 80,000. This is only one small item of the equipment required, but it is important. The southern lumber industry usually transports about 95 per cent. of its sawlogs by lorry. Drastic curtailment in the production of lorries and tractors and of road-building equipment has been a great handicap to the industry. There have been long delays in obtaining essential new equipment and repair parts, lack of the latter resulting in some instances in equipment being put out of use for several months. Limited relief may be effected through the deposition of Army surplus equipment. So far approximately 2,500 lorries have been declared in this category, but only a small percentage are suitable for use in the lumber industry.

U.S.S.R. According to a statement from official sources in Moscow, forest fires have been reduced by 50 per cent. in the last 5 years. Aeroplanes patrol the forests and when a fire is seen a message is dropped in the nearest town or village. The farmers and lumbermen of the vicinity thereupon mobilize to fight the fire. In remote regions fire fighters and their equipment are dropped by parachute (3; 13.5.44).

According to the Soviet press, a saving of more than 260,000 tons of 'mazut' was effected in the Soviet Union last year through conversion of machinery to the use of fuel other than petroleum. Simple wood-burning producer units are said to be serving a number of munition factories and machine plants with such success that a campaign is under way to popularize the use of such units (3; 29.7.44).